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MORGAGNI'S
CAUSES
OF
DISEASES

Vol. I



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THE
SEATS and CAUSES
OF
DISEASES

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INVESTIGATED BY ANATOMY;
IN FIVE BOOKS,
CONTAINING
A Great Variety of DISSECTIONS, with REMARKS.

TO WHICH ARE ADDED
Very ACCURATE and COPIOUS INDEXES of the
PRINCIPAL THINGS and NAMES therein contained.

TRANSLATED from the LATIN of
JOHN BAPTIST MORGAGNI,
Chief Professor of Anatomy, and President of the University at PADUA,
By BENJAMIN ALEXANDER, M. D.

IN THREE VOLUMES.

VOL. I.

770

LONDON,

Printed for A. MILLAR; and T. CADELL, his Successor, in the Strand;
and JOHNSON and PAYNE, in Pater-noster Row.

MDCCLXIX.

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VOL. I.

LONDON,
Printed for A. MILLAR, and T. CADELL, in Pall-mall; and J. JOHNSON and P. NEAVE, in St. Paul's Church-yard.
MDCCLXXII.

T O

Dr. F O T H E R G I L L.

SIR,

THE great excellence, and usefulness, of the work which I have attempted to translate, claims a patronage from the most eminent physicians. And could I flatter myself that the translation bears any tolerable proportion to the merit of its original, perhaps the patronage of this production might not seem altogether unworthy of the most respectable characters.

In the present case, however, I cannot but acknowledge the humanity and condescension of Dr. Fothergill, in permitting his name to stand prefix'd to this performance. The countenance of a physician so deservedly at the head of his profession — so universally esteem'd through these kingdoms and their dependant colonies — must not only do honour to the translator, but generally extend the utility of the work.

You will see, Sir, that, in this undertaking I have aimed at nothing but the praise of a faithful translation. And my great ambition will be to have been useful to the public without being a discredit to my patron.

There are but very few persons who have abilities for original writings, and very few indeed who have resolution
sufficient

DEDICATION.

sufficient to cultivate those abilities by long courses of labour and application. Both these happy requisites, however, we see united in Dr. Fothergill. And from the proofs he has already given of his talents for medical composition, we cannot help wishing to see his researches carried on to a greater extent. That almost immense experience in diseases, that ingenious turn for observation and inquiry, joined to a great capacity, and clearness of conception, could not fail to be of importance to physicians, and of advantage to the public.

Yet while you, Sir, are thus continually harass'd by the solicitations of that public — while you are thus unremittingly, and unavoidably, employ'd in alleviating their distresses — how can we hope to have the full advantage of your admonitions? Nevertheless I hope the time will come, when the public will be favour'd with more of them — That for this purpose, or as well as the many other purposes of so valuable a life, you may be long favoured with health, and every pleasing capacity of usefulness, is the sincere desire of

Your greatly obliged friend,

April 7th, 1768.

and very respectful humble servant,

BENJ. ALEXANDER.

T H E
T R A N S L A T O R ' S
P R E F A C E.

THE business of a Translator is to convey, with faithfulness, the ideas of his author. The greater precision and clearness he shall give to these ideas, the more will his merit in translation encrease. And if to these qualities of faithfulness, precision, and clearness, he could add ease and elegance of diction, the work would certainly attain to the highest degree of perfection of which its nature is capable. For it is not with translation, as it is with original writings, and works of genius, where the invention and fancy have a principal share and merit in the production.

There are, however, some works of science, and abstruse literature, wherein a great freedom of style, and an elegance of language, can neither be requir'd, nor admitted. To attempt the one, or the other, would be to interrupt the business of *technical* narration, and to render those ideas which ought always to be precise, and well-defin'd, loose, dissipated, and obscure,

Whoever, therefore, may attempt, in works of a scientific or abstruse nature, to heighten the merit of his productions by the addition of classical ornaments, in whatever language he may write,

will be so far from improving, though he may somewhat amuse, his reader, that even the attentive mind must, of course, be left vacant and uninform'd. And it is always shrewdly to be argued, that such writers are incapable of communicating precise ideas, or, at least, that they chuse to affect the praise of elegant scholarship, and polite learning, in preference to that of more useful science, and more severe erudition.

This affectation, however, has seldom been imputed to physicians. And, indeed, it is seldom that the nature of medical science will allow of the attempt. For if we except mathematical learning, and abstruse philosophy, there is, perhaps, no science in nature wherein a precise, definite, and *technical* language is more strictly and absolutely requir'd. It is not at all surprizing, therefore, that, by readers of the more exalted and elegant class, medical writings have been look'd upon, in general, as clumsy and unpleasing compositions.

Yet this, we see, is not to be consider'd as a reproach to physicians, but as arising from the necessity of the subjects on which they are employ'd. For men who have devoted themselves to the study of physic have, for the most part, neither been wanting in capacity, nor in learning. Nor have they fail'd to acquire themselves with manliness and elegance, whenever they have had occasion to exert their abilities in the more pleasing departments of erudition and philology.

It is very certain, that many of the more improving sciences become the natural products, if I may be allow'd to speak thus, of that province which it is their business to cultivate. And an enlarg'd proportion of knowledge in the languages, and in other parts of classical attainment, are indispensable to the theoretical, if not to the practical, physician. Yet what medical writer, that has utility and instruction in view, would wish to quit the path of simple and technical narration, in order to collect together the flowers of elegance, and the refinements of language? To what purpose would be the pomp of rhetorical flourish! the diffuse and figurative diction! the pathos or the energy of style! To what purpose

pose all the labour'd, yet nicely-conceal'd, arts of declamation, but to throw a dazzling lustre upon his ideas, and render his thoughts indistinct and confus'd? And, in a word, what would it be less than an insult on human nature, to degrade the science, whose natural objects are the preservation of life and of health, into the mere romance and amusement of an hour?

This disquisition, however, I did not enter into with a view of accusing others, but of exculpating myself. For whoever shall read the work before us, in its present English dress, will find that the translator has no-where studied a diffuseness, a pomp, or an elegance of language; but that clearness and precision of ideas were the sole objects of his attention.

Instruction, not amusement, was his aim. And indeed, that this only ought to be, and could be, the object of his views, must be evident to every-one who reads the original with accuracy and penetration. For the excellent author himself, though perfectly skill'd in polite literature, as is well-known to the learned world, has been under a necessity, from the nature of his subject, of confining himself to technical ideas. And such are the enquiries upon which his discourses turn, as, for the most part, to exclude all attempts after classical elegance, or embellishments of language.

And from hence it may, perhaps, principally arise, that his style has, to many, seem'd intricate and perplex'd; because the work being loaded, in every part, with science, and his intention being always to dwell as little as possible upon prolix narration, he has necessarily fallen into the mode of frequent parenthesis, whereby his periods are drawn out to a considerable extent. For though it might seem, that this inconvenience could have been obviated, by annotations in the margin, yet these our author consider'd as still more inconvenient to the reader, by withdrawing his attention from the thread of the narration, and breaking, as it were, the very energy of the discourse.

I cannot, indeed, but be so far of his opinion, as to think, that, in the present work, any method beside that which he has chosen,

would have been liable to more important objections. For such is the nature of the subjects whereon he treats, as to make it necessary, even for the learned reader, to employ every intellectual power, and maintain every faculty of the mind in full, constant, and vigorous exertion, in order to comprize the whole compass and competition of ideas.

If such, then, be the nature of the work, and there be so great a difficulty in the comprehension of its views, it is not surprizing that the difficulty of translation has been so much insisted upon. For where it is not easy to conceive of an idea, it must of course not be easy to represent and convey it properly to others.

Indeed, this difficulty of translation has been universally acknowledged by all persons well-acquainted with the nature of the work in question. And so far has the conviction been carried, by a gentleman eminent for his learning and abilities, as to make him assert that it could not be translated by any-one whatever : which assertion I do not here take upon me to disprove, as it might, in this case, be very shrewdly replied, that the work is as yet untranslated.

However, I shall esteem myself happy, if this translation, when in the hands of the learned, shall be found erroneous in such points only as do not materially affect the sentiments of its author. A merit beyond this I neither plead nor attempt. And this I am in some measure embolden'd to hope, by the candid approbation which the work has met with from gentlemen whose names are amongst the most eminent in physic. An approbation of so much importance, as already to have remov'd, in some degree, the fears and tremors of one who is about to be an adventurer in the lottery of publick reputation. Nor will the weight of such opinions be doubted, if, besides others whom I might mention, the respectable characters of those gentlemen be consider'd, who have done me the honour of permitting their names to stand at the head of these volumes.

And here let me acknowledge my obligations to my friend and neighbour Dr. Wayman. This gentleman's condescension in reading
the

the written translation to me, during my correction of the proof-sheet, has greatly expedited the work. Nor has the assistance receiv'd from him been that of an *Anagnostes* merely. His knowledge of the subject in question, and of the language from whence the translation had been made, render'd him very proper to recur to on any occasion of doubt. This assistance in correction, therefore, when time would allow it, might be consider'd as a farther revival of the work. And to the Doctor's candid observations this performance, in many parts, stands indebted.

After all, the merits of this translation, such as they are, must be submitted to the decision of the public. And I would wish to engage the candour of my reader, by reminding him that it was usefulness alone which I had regard to in the execution of the work. And I would have him, at the same time, be inform'd, that when I first was desir'd to engage in it, I did it with a view of instructing myself, as well as others. Nor was I displeas'd with an opportunity of filling up, to the greatest advantage, that leisure which I had then no prospect of seeing so speedily broken in upon, by the addition of public and private avocations.



T H E
A U T H O R ' s
P R E F A C E.

THERE are two sayings of C. Lucilius, as you have it in Cicero (*a*); I mean, " That he neither wish'd to have " his writings fall into the hands of the most unlearned, " nor of the most learned readers ;" which I should equally make use of on the present occasion, if it were not my desire to be useful to the unlearned, as well as to be assisted by the learned, reader. For I have had two views in publishing these writings; the first, that I might assist the studies of such as are intended for the practice of medicine; the second, and this the principal view, that I might be universally useful, though this cannot happen without the concurrence and assistance of the learned in every quarter. In what manner I have endeavour'd to execute these intentions will appear from this preface.

2. Theophilus Bonetus was a man who deserv'd the esteem of the faculty of medicine in particular, and of mankind in general, in an equal degree with any other, on account of his publishing those books which are entitled the *Sepulchretum*. For by collecting, in as great a number as possible, and digesting into order, the dissections of bodies, which had been carried off by diseases, he form'd them into one compact body; and thereby caus'd those observations, which, when scatter'd up and down through the writings of almost innumerable authors, were but of little advantage, to become extremely useful, when collected together and methodically dispos'd.

(*a*) L. 2. ♣ Orat.

As the publication of this work gave pleasure to every-one, which it was natural to expect, the same was re-publish'd in the year 1700, under the inspection and revisal of Jo. Jacobus Mangetus, but at the same time with additions which made up a third part of the work. Of this, therefore, as of a fuller edition, I would always be understood to speak.

3. And first, if there are any persons who think that the intention, and labour, of both these editors are greatly to be commended, I readily concur in opinion with them, and shall always concur. But when I read in the writings of authors, in other respects very excellent, that the *Sepulchretum* is a work compil'd "with incomparable diligence, by collecting the choicest observations from every author, and reducing them under proper heads," and other assertions of a similar nature, I wish it were in my power to assent to these likewise.

Why I think it is not in my power to agree, I will presently declare: yet I shall always be mindful of what I just now readily granted; and, besides this, shall consider, that two men alone, though never so industrious, could not possibly be equal to an undertaking which was not only new in itself, but almost inconceivably vast and laborious: for, as you have it in the fourth book of the *Iliad*, if I rightly remember, "The gods have not put every thing in the power of men;" and, in the twelfth book, "The work of many is most perfect."

4. All these things, then, I readily advance and acknowledge: yet if a work so useful is to be render'd more useful for the future, it ought not to be conceal'd, that there are observations still remaining, not only in ancient, but even in modern authors, whose works were extant before the second edition of the *Sepulchretum*, which ought by no means to have been omitted: these observations are far from being few, and do not merely belong to writers whose names are never mention'd in that work, but even to such as are mention'd therein.

On the other hand, it may be observ'd, that such observations as, through negligence, are repeated in one and the same section, and sometimes even in one and the same page, after having been given before, ought to have been omitted in the second place; and not only these, but such as, being so metamorphos'd by a certain crafty writer, that, if you consider the names of the patients, their conditions, and places of abode, appear to be entirely new; yet, if you consider the things themselves, and the doctrines resulting therefrom, you immediately perceive to be the same as we read above from their true authors.

To these add the observations wherein you have natural appearances propos'd as morbid ones, or those things which relate to some peculiar species of injury, as appearances of a far different nature, when an aneurism, for instance, is represented as an abscess: for such observations, certainly, ought not to have been admitted, or at least not without some strictures, and reasons for doubting being subjoin'd; since any one who is but slightly practis'd in the dissection of sound and morbid bodies, would at once discover their fallacy.

I omit such as are not dispos'd under the heads whereto they properly belong, such as are falsely copied from their authors, such as are taken from you know not what author, or such as you would suppose to be from authors in whose writings they do not exist: and lest I should be too prolix, I willingly omit, besides these, whatever you might rather chuse to ascribe to the carelessness, or ignorance, of the printers; notwithstanding these oversights, if not corrected, may lead readers into the most grievous mistakes, and therefore diminish the usefulness of the work. And this usefulness is greatly diminish'd by two other circumstances, of which I shall immediately speak; but in the mean while I will take upon me to affirm, that whoever shall peruse these books of mine, will be fully satisfied, that none of the assertions which I have now made, were hastily or rashly advanc'd.

5. As there are very few diseases, especially if of any long continuance, to which some other disorder is not join'd, or to which many different symptoms are not added; for this reason every observation of such a disease, after having been given at large under the head whereto it particularly belongs, ought, without doubt, to be made mention of under other heads to which it likewise relates in some measure: this, however, should be done in a few words only, so as just to refer to the place where the reader, who ought to consider the whole of the observation, and not take it piece-meal, may immediately find it complete.

Nor is it sufficient, as is done in the Sepulchretum, to refer to the section, which frequently contains a great number of observations, as at that observation of Jo. Petrus Lotichius, for instance; to produce one example, at least, from among others almost innumerable; which, besides that it is not made mention of under all the heads it ought to be, is, in four of the sections wherein we find it referr'd to, I mean those *De Dolore Capitis*, obs. 10. *De Insomniis & Incubo*, obs. 2. *De Vertigine*, obs. 7. & *De Convulsione*, obs. 13, always referr'd to in the section *De Melancholia*.

The reader, therefore, is under a necessity of turning over the whole of this section, or, in other words, the fifty observations of

which it consists, in order to find, with difficulty, that which is there mark'd thirty-one. And I say with difficulty, because in all those four places the patient is spoken of as a *young man* only, in the beginning of the observation, but as *the servant of a tradesman* in this.

Yet even when he has read it over, and has found it to be that to which he was referr'd, do you think he then sees the whole of it? Certainly not. For the external cause of the disorder is wanting, I mean the philtre which had been given: and other circumstances are also deficient, where the reader would not so much as suspect it, unless he should happen to stumble on that place in the section *De Dolore Capitis*, or, what would be still more to his purpose, should read it in the work of the author.

But to attend solely to the assertion with which we set out; I mean, that a great deal of time is necessarily consum'd in looking for any article to which we are referr'd; you undoubtedly see that the work would have been much more useful, if the whole of the observation, having been fully propos'd, on the most convenient opportunity, and mark'd out by a certain number, were always to be made mention of, wherever it was necessary, as under that number, and not merely by saying in what section it had been given.

6. But two very accurate indexes, added to the work, would, at least, have been of far greater advantage. I remember that when the *Sepulchretum*, which had been lately printed, was just imported to Bologna, where I then resided, I was prodigiously pleas'd to find these words in the title-page, *With the necessary indexes*.

But my joy lasted no longer than till, looking for these indexes, I found that there was only one, and that this contain'd nothing more than the titles prefix'd to the observations: and as a great number even of these titles are either undesignedly imperfect, or confessedly so, and without any disguise, and all of them are dispos'd exactly in the same order as the observations themselves; it is impossible to say, how many symptoms, or how many morbid constitutions of parts in like manner, are describ'd in the observations indeed, but not taken notice of in the index; not to say that each of these symptoms, or morbid appearances, are not exhibited, at one view, together with the others which are similar thereto.

For from this defect the great and primary advantage of the work is totally cut off; as this advantage could only have arisen from having a great number of similar symptoms at hand, so that you might readily compare them with many morbid appearances; which were either similar, or not similar, to each other; and by this means be able at once to conceive, which of those symptoms are most frequently,

quently, most rarely, or never, join'd with any particular species of internal morbid constitution.

I remember, likewise, that, as young men are generally presumptuous enough to entertain thoughts of the most difficult and laborious undertakings, I did not even then despair, but if I should have sufficient leisure in future time, I should not only be able to supply the deficiencies that I have pointed out in the *Sepulchretum*, and others besides these, but also that I should be able to reform the indexes; and I even thought of a plan whereby this might be done, and communicated my plan to that respectable society, which is now call'd the Academy of Sciences.

7. As to the remaining inconsistencies of the *Sepulchretum*, which I just now hinted at, they chiefly relate to the scholia. And though I did not doubt, but many of these were longer than was needful, I nevertheless found that they seem'd to be so much the longer, by advancing, in the place of useful remarks, either such as were but of little use, or such as could scarcely be admitted; and even sometimes by repeating these things over again.

It would not have been proper, however, to repeat even good things, but only when a remark has been once given, to say in a single word, whenever there was occasion to refer to it, in what place it was to be found: and it would have been proper conveniently to subjoin to some places of observations the doubts of the compiler, and at other places to observe how far they agree with other observations, to shew what consequences might be drawn therefrom, in order to illustrate the theory, but particularly to illustrate the practice of medicine; and this not by doctrines which are, at present, either quite given up, or call'd into question, by most persons, but by the more probable, easy, and even, as far as could be, the most common modes of explication.

I do not, indeed, deny that some of these cautions are here and there attended to, in the scholia of the *Sepulchretum*; nor am I ignorant what doctrines were in vogue in the time of Bonetus. But the question is not here of refuting him; but of rendering his work more useful, and more consistent with the superior doctrines of the present times.

8. As, therefore, I had not fail'd to revolve in my mind, more than once afterwards, all these circumstances which I have hinted at in regard to the *Sepulchretum*; and had even begun to contribute, as much as my poor abilities would allow, in order to encrease its utility; I was exceedingly encourag'd in the prosecution of my design by the remarks that I read, from time to time, in new publica-

tions of learned men : for instance, " That scarcely any-thing was " more useful than that work ;" nor was there any work which " better deserv'd to have a supplement added to it, and be brought " down to the present times : " and, in like manner, that " It is " surprizing how much it might be encreas'd, and with how much " a better index it might be furnish'd, in order to make it advantageous to students : " but, to omit other things, " That the work " of Bonetus would, however, have deserv'd greater praise, and more " esteem, in part, if he had been somewhat more accurate in selecting the observations, and referring them to particular diseases, " as to their respective heads ; and in part, if he had admonish'd us " in the scholia and annotations, what things were here and there " uncertain, or altogether false, or what were not properly explain'd " by their authors."

Now, then ; in an affair wherein every one is concerned, and not only in the present, but in future ages ; in order to judge more easily what may be expected from me alone, and how far it is just to expect it, I must by no means conceal the circumstance which first gave occasion to my writing these books.

9. The anatomical writings of Valsalva being already publish'd, and my epistles upon them, it accidentally happen'd, that, being retir'd from Padua, as in those early years I was wont frequently to do in the summer-time, I fell into company with a young gentleman, of strict morals and an excellent disposition, who was much given to the study of the sciences, and particularly to that of medicine. This young gentleman, having read those writings, and those letters likewise, every-now-and-then engag'd me in a discourse, than which nothing could be more agreeable to me ; I mean, a discourse in respect to my preceptors, and in particular Valsalva and Albertini, whose methods in the art of healing, even the most trifling, he was desirous to know : and he even sometimes enquir'd after my own observations and thoughts as well as after theirs.

And having among other things, as frequently happens in conversations, open'd my thoughts in regard to the Sepulchretum, he never ceas'd to entreat me, by every kind of sollicitation, that I would apply to this subject in particular ; and, as I had promis'd in my little Memoir upon the Life of Valsalva, to endeavour that a great number of his observations, which were made with the same view, should be brought to public light, he begg'd that I would join mine together with them, and would shew in both his and mine, by example as it were, what I should think wanting to compleat a new edition of the Sepulchretum, which he, perhaps, if he could engage his friends to

assist

assist him, would, at some time or other, undertake. He also desir'd that I would write in as familiar a manner as I would wish; and by this means throw in, at any time, what I had said in conversation, or medical conferences, or any thing of that kind, which, though never so minute, would always be very grateful to him.

You ask me what was the effect of his entreaties? I suffer'd myself to be prevail'd upon. For you see what he requir'd of me was partly what I had promis'd in that Memoir, and partly what I hop'd would be of use, if it should turn out agreeably to my design; as by being afterwards revis'd and publish'd, it might, some time or other, excite persons, far more capable than myself, to undertake the same kind of labour.

With this view, then, I began, upon returning to Padua, to make a trial of that nature, by sending some letters to my friend. And that he was pleas'd with them appears from two circumstances; the first, that he was continually solliciting me to send him more and more after that, till he drew me on so far as to the seventieth; the second, that when I begg'd them of him, in order to revise their contents, he did not return them, till he had made me solemnly promise, that I would not abridge any part thereof.

10. You see then, candid reader, why I said in the beginning, that I would not have these writings of mine be read by the most unlearned; and should also have said, nor yet by the most learned; if they had only contain'd those things which he insist'd upon being retain'd; I mean, such as might be useful to students.

But I am not at liberty here to make use of that expression of Lælius (b), *Perfium non curo legere hæc: Lælium Decimum volo*: "I do not chuse Perſius should read these things; but would wish Lælius Decimus to read them:" nay, I even wish the *Perſii*, that is the most learned men, to read them, and, leaving the other parts to the *Decimi Lælii*, that is to youths of learning and genius, to consider only my intention and desire; and if these are not disagreeable to them, to assist by their assent, or, if they think it will answer a better purpose, by their admonitions and examples, in making the Sepulchretum of the most utility it can possibly be. And that they may do either the one or the other the more easily, I will tell you what I have done with this intention, in the subsequent letters; and that in as few words as it is possible on a subject which is so complex, and requires to be related so clearly.

(b) Ciceron. l. cit.

II. The observations, (for I will begin with them in order to preserve nearly the same method which I made use of above) the observations, I say; I mean those which I have observ'd to have been omitted in the *Sepulchretum*, from the ancient or more modern authors, though they might have been included; and those moreover that have been made public since the second edition of this work; I have pointed out each under their proper heads, in as great a number as occur'd to me when writing.

And this I say, that every-one may know a great number to be still remaining, which might be added; for out of the books that I have read, I did not call to mind all the contain'd observations, and from those which I had not read, it is certain none could occur to my mind: and there are many which I have never seen, either because they have never been imported hither during the present calamities in which Europe is involv'd, or because I am not very well skill'd in the languages wherein they are written; and I do not chuse to put great confidence in any interpreters, especially in affairs of this kind.

In each section of the *Sepulchretum* also, if you except a few of the former ones, I have not neglected to take notice, as far as it was in my power to observe, what observations are given more than once, either from the effect of carelessness, or in consequence of the impositions of a crafty metamorphoser; nor yet in which of them either natural appearances are describ'd as morbid, one disease is represented as another, or the printers have been so careless, as to subvert the very intention of the observers by their preposterous blunders; so that by such strictures, I think I cannot fail being of great assistance to any persons, who shall hereafter undertake to give a new edition of the *Sepulchretum*: for though some of these animadversions are minute, yet they are by no means of little importance.

I wish I could have been of equal assistance, either when the readers are refer'd to some other place, where they may find this or that observation more fully describ'd, and yet the number of the observation is not expressly pointed out; or when they are overwhelm'd with stupendously-long scholia, and yet such as do not contain the more useful remarks, but at one time superfluous things, at another time repetitions, and sometimes such as are false, or, at least, very doubtful. Of these things, indeed, I have sometimes admonish'd my readers: but always to do it would have been endless.

There is no occasion, however, to tell those who know any thing of the matter, that I had not leisure to compose the indexes which are so necessary, and would require so long and so arduous a labour.

I hope it will be thought quite sufficient, by any reasonable persons, that at my time of life, and without any one to assist me, even a pupil, or an amanuensis, I have at least, not only in these last-mention'd instances, but also in others whereof I have spoken, all of which shall now be recapitulated in their order, shown by my own example, such as it is, in what manner it appears to me, that the Sepulchretum may be much enlarg'd, and at the same time render'd much more useful and correct.

12. I therefore produce observations which have never been publish'd before, a great number of which are Valsalva's, not a few of my friends, but the greater part mine. To the first, on account of the author's merit, and the respect which I owe him, I give the first place under each head. And these, which have been collected with the same care that other things were formerly, as has been said in his life, and where they were written in Italian translated into Latin, and all of them copied over again in the manner that I knew he had been accusom'd to wish, I give with such a scrupulous exactness, that, as I have sometimes doubted whether I rightly conceiv'd of them or not, I have chosen rather to produce his own words, without taking away or adding any thing, except what I had receiv'd from his own mouth: for this happen'd in regard to a few observations which he had given an accurate relation of to me, and had not committed to writing. And the other observations I took from his papers, which were some of them connected together, and some loose.

And although these papers, after having taken out from them, in every respect that was necessary, the observations, experiments, and other things that are given in these Letters, I return'd, number'd and seal'd up, in the same manner as before, to his son-in-law Lewis Montefani, that celebrated man, who is librarian to the Academy of Sciences at Bologna; yet if any-one should chuse to compare a particular paper with these my descriptions, and should ask me by what mark he might find it, in so great a number of papers, I shall have no objection to telling him, nor yet to shew any letter, whereby my friends have communicated to me their observations which I make use of in these books, as they are all of them men of well-known integrity, skill, and accuracy.

For, finally, in respect to my own observations, I have particularly related in each, the year, month, and place in which they were made, and who assisted me, or were present, at the time, unless I had sufficiently done it before. And I have not only remark'd the age and sex of the patient, but other things also that Peyerus (c) requires, as

far as it was in my power to learn, and amongst these such as relate to the method of cure which had been applied: though it may be necessary to admonish my readers, that they are not, by any means, to impute a particular method of treatment to me or to Valsalva, unless we say it was prescrib'd by us, any more than they would the external causes and the symptoms of the diseases; for we relate these just in the same manner as we do the method of treatment.

And in describing the dissections themselves, I thought it particularly behov'd me to take care, that I did not admit, what I so greatly disapprov'd, in some certain descriptions of other authors; I mean, that I should not consider as morbid appearances, either those which are agreeable to the usual order of nature, or not far different therefrom, such as some varieties, for instance, are.

I have endeavour'd also that the histories should not be divided, but should be exhibited at one view: or if it did, at any time, happen (though this was but rarely) to seem more advantageous to divide them, or, what happen'd very often, to take notice of them, I have taken care to point out that very place, in which either the remaining part, or the whole, of the history might be found: and I have been equally cautious of repeating even any-thing that might have been formerly treated of fully in some of my writings; inasmuch as it is *odious to me*, in the same manner as it was to the Ulysses of Homer (*d*), *to relate over again any-thing that has been fully related*. For by these means the histories really become too long; but not when all the circumstances which relate to the foregoing causes of the disease, and to the symptoms, (all which I wish could be equally and fully known at all times) or to the injuries of parts observ'd in the bodies, are accurately describ'd. And indeed they often give us occasion to observe, as I have done, not only what, in each of these classes, were present, but what were absent likewise.

13. But what shall I say of the prolixity of the scholia? I was not ignorant indeed, that this was not very agreeable to most readers, and totally disapprov'd by some; although I see that Peyerus, who is one of the last-mention'd class (*e*), has adjoin'd, to his history (*f*), a scholium that is longer than itself by seven pages. In the first place, however, I say that all the matter, besides histories, which is contain'd in these letters of mine, is not scholia. And in the second place I say, that if I was to supply, in my scholia, the many circumstances which I have said are wanting in the scholia of the Sepulchretum (*g*), I could not avoid detaining my reader considerably.

(*d*) Odyss. l. 12 in fin. (*e*) Meth. cit. c. 5. in fin. (*f*) Ibid. c. 6. (*g*) Supra, n. 7.

And what will you say to this? that almost innumerable observations were to be pointed out, at the same time, to be added to it; and that it was likewise my business to show what errors had been frequently committed, in selecting, copying, disposing, and marking out, either on account of the great quantity of matter, or by the carelessness of the printers, those observations of which the work already consisted.

Here you will perhaps enquire, whether I do not suppose that I have also been very often faulty, I do not now say in correcting the blunders of the printers, from whom I was certainly at a great distance; but I say in that very point upon which I so much disapprov'd those scholia; I mean, in the choice of theories and opinions, whereby to explain the observations that were the most easy, probable, and common, or such as the greater part of physicians had not called into question?

I, however, am a person who think that there is nothing human which may not fall to my lot; and that not only in this case, but in any other. Yet in this case, considering to whom I was writing, I took all the pains I could to avoid abstruse, difficult, and singular modes of explication, and studied to make use of such as were obvious, plain, and almost common; I mean, almost common at the time wherein I began to write.

For I had already made a considerable progress in writing, when certain controversies began to be suddenly agitated; but as it would have been too laborious an undertaking to alter what was written on this account, I thought it would be sufficient, if, in what remain'd to be written, I should be so cautious as to give no-one a just occasion of complaint; and the more so, as I left every-one at his liberty, both then and before, to use any mode of explication he should prefer, if he happen'd to disapprove what he might find in my letters. For this was not what I had principally in view: nor do I furnish any-thing, to speak strictly, besides the observations; since, in regard to the other parts, I give free leave to every reader to approve or disapprove, just as if they were not mine: and this I do because I should, otherwise, be afraid, lest, when speaking from opinion only, notwithstanding I make probability my guide, some-body should nevertheless rise up and retort upon me, agreeable to what Homer says^(h), *Dixit mendacia multa, dicens veris similia*: "In saying things that were probable, he utter'd many falsities."

Wherefore, I have not dwelt long upon explications, and have

(h) *Odyss.* l. 19.

taken care to intersperse other remarks relative to the practice of medicine, some of which relate to the history thereof, and some to the history of anatomy, and, finally, many things which relate to other studies and pursuits of the young gentleman to whom I address'd the letters; and this with an intention to withdraw his imagination, for a while, from the horrid and perpetual idea of diseases and dead bodies. Now, then, if you duly consider all these parts of the publication, and disjoin them from the scholia, you will plainly perceive, that the proportion of these scholia, when taken separately and in a strict sense, is not very considerable: or, if you should think it considerable nevertheless, be so kind as to leave them, without regret or grudging, to my *Lælius*; and consider, at the same time, that those things, and others with which you are displeas'd, may be equally displeasing to me at present: yet these are the very parts which he made me so solemnly promise not to withdraw.

14. Do not expect, that, before I speak of the indexes which are added, I should here repeat what I have said in my preface to the Anatomical Epistles. For in that preface (*i*) I have said enough to inform every-one, why I have been so long taken up in writing this work also, which is in many respects similar to that, and why I wrote it in the form of letters. Or, if what is there said is not sufficient, add to other causes of delay this very reasonable one, that, from the time of publishing those epistles to the present time, I am so far advanc'd in life, that all these parts of the work, after being revis'd with the utmost diligence I was capable of, at length came abroad into the world almost in the eightieth year from the time in which I was born.

But there is much less reason to wonder, at present, why I prefer'd the epistolary manner, not so much in conformity to the example of modern and ancient physicians, (amongst whom *Marnardus* (*k*) recounts Archigenes and Themison; the former of which authors, according to the testimony of Galen, wrote eleven books of medicinal epistles; and the latter, according to the testimony of Paulus, ten) as in conformity to that of the greatest anatomists mention'd in the preface already spoken of (*l*), who have written much longer epistles than I, as I shew'd above (*m*), from whence the occasion of writing these letters arose, and as the letters themselves plainly and jointly demonstrate, on proper occasions, with whom I had to do; for by these means it became me, in writing

(i) N. 1. & seqq.

(k) L. 1. Epist. Medic. 1.

(l) N. 3.

(m) N. 9.

to a young gentleman who was my friend, to say such things every-now-and-then as would have been useful to the students who attend my lectures. And although the younger Pliny (*n*) concludes his letters to Tacitus in these words, *It is one thing to write to a friend, and another thing to write to the public in general*; yet he, nevertheless, publish'd those very letters with the others, as he did not doubt but every-one, who should read them, would see that they were not written with an intention for public inspection.

Nor would I have you suppose, that I think differently of these letters from what I thought of my Anatomical Epistles (*o*), because you see that I have divided them into books. For I still continue in the same opinion; and I think this sufficiently appears from the series of numbers, by which they are particularly mark'd out, not being interrupted by such a division: and I, moreover, not only think this order more convenient for the completion of the indexes, but also for referring the reader, as is often necessary, to this or that letter; and, in all probability, it will be found more ready and convenient for others as well as for myself. As to the title of the books, however, and that particular division of them, they had their origin from far different causes. For they were not only desir'd by the booksellers, but were requir'd in conformity to the order of the Sepulchretum, which was the plan I had laid down to myself, and is distributed in this manner: and, finally, this distribution exactly corresponded to a certain very just thought of mine, which I will immediately declare.

15. That is to say, as, when a young man, I had not omitted to testify publicly, to the first academy of sciences which had admitted me, the feelings of a grateful mind on that occasion, and had seen that testimony receiv'd by them with the same degree of condescension, wherewith they had formerly conferr'd so many benefits, as are mention'd by that very celebrated man Francesco Maria Zannotti (*p*), who is one of the committee to that body, and to the Institution of Sciences at Bologna; why should I now, that I am grown old, suffer myself to die under the influence of ingratitude to five other of the most noble academies of sciences in all Europe, which had, afterwards, very condescendingly and very honourably, chosen me into the number of their fellows? Therefore, as I had nothing, nor could hope to have any-thing, whereby I might shew myself to have a grateful sense of their favours, in the best manner I was

(*n*) L. 6. Epist. 16.

(*o*) Præfat. indicat. n. 3.

(*p*) Commentar. de Bonon. Sc. Inst. Tom. 1. ubi de ejus Academia, c. 1. & seqq.

able, unless I should depute persons to wait upon each of them, to assure them of my gratitude and duty towards them, and, at the same time, present them with a copy of this work, and request that they would each of them accept it, such as it was, with their well-known condescension, and consider the intention rather than the thing; I did not think that I ought to lose such an opportunity.

And that this might be known to all of them, it very conveniently happen'd, that the number of books, into which these letters were naturally, and of themselves, divided, exactly corresponded to the number of academies; so that I could prefix to each of the books that very letter, wherein I should signify what I would wish to have said, to each of those respectable bodies, in my name. These letters I have prefix'd without observing any other order, than that of the time in which I was chosen into their celebrated societies: and that they might be the more read by every-one, I added several other things to the testimonies of a grateful and respectful mind, and of those five letters made so many prefaces, as it were, in which I might demonstrate how great an advantage there is arising from the dissections of dead bodies.

In the first, therefore, having argued against some persons, who have been presumptuous enough to call this utility into question, I have shewn in what manner the deceptions, which have been made use of as objections to the practice, may be avoided by those who dissect bodies, and who prove both the seat and the cause of the disease, which are, for the most part, easily demonstrated from the dissection. In the second I have confirm'd the same utility, by the full and ample consent of almost all physicians, particularly those who have flourish'd amongst the most polite and cultivated nations, from the most ancient times, speaking of the merits of each nation in regard to this question, and mentioning the name of most of the physicians in order; and especially of those who, from their own observations, or even the observations of others, wish'd to have compil'd a *Sepulchretum* before the time of Bonetus. In the third an answer is particularly given to those, who, because dissections are of no use in order to detect the first and most hidden causes of diseases, and such as are entirely inaccessible to the senses, think that it is, therefore, quite needless to prosecute the practice, as if they did not thereby detect any evident internal causes, or the knowledge of these causes were of no advantage, because, even where they are known, a great number of disorders are, nevertheless, still uncur'd.

In

In the fourth I make this enquiry, whether it is more useful to dissect the bodies of those who died of the more rare, (for some of these also I have dissected) or of the more common diseases.

In the fifth, finally, it is shewn, that, although the anatomy both of sound bodies, and of those that are carried off by disease, is useful, the latter is, nevertheless, by far the more useful.

And as all these circumstances ought, some for one reason, and some for another, not to be pass'd by; so if they had been all thrown together into this preface, they would have made that discourse, which is already long, in consequence of the many things that were necessarily to be spoken of, extremely long and prolix.

16. It now remains, at length, to speak of the indexes. I have given four: the first of which is the shortest, the last the longest. For the first contains nothing but the arguments of the several letters and their order. And this order I was under the necessity of pursuing without deliberation, as I was oblig'd to follow Bonetus. And this author, as the custom was then with most physicians, follow'd Alexander Trallianus in general; who, as Freind (g) has observ'd, notwithstanding "others had digested disorders in a very confus'd manner, dispos'd them, nevertheless, in such order, as to begin "with the head, and go on to the feet."

And from hence you have the reason why, although I should have rather chosen to begin with the apoplexy, as of a disease in respect to which I have more observations, and could remark many and various things, from whence it might more certainly and more easily be known what is given in these books; I, nevertheless, began with the pain of the head.

As to the last index, it is very copious for this reason, that it points out particularly every thing which may seem to be more worthy of remark, whether you have an eye to the state of the parts as natural or morbid, or the history of anatomy, and some certain controversies, whether the varieties, and other less frequent appearances, or the medical admonitions and observations, are consider'd; or, finally, it is said by whom the dissections, that are not now first given by us, have been given.

For I have still pursu'd my method of expressly ascribing to every-one his own, and, in like manner, of commending the greater part of the most famous modern authors, (and I wish they were all still living) who have deserved well of our faculty, or of me; and

(g) Hist. Medic. ad A. 500.

of particularly pointing out some faults of the ancient authors only, or, at least, of those who are no longer living, that younger physicians might not be misled by their authority. And amongst other things, as having a reference to our chief view, those passages are pointed out, where I did not think it became me to conceal what seem'd to be wanting in the Sepulchretum, what might be corrected, or what taken away, and in particular what it seem'd proper to add thereto.

17. To the same purpose the two remaining indexes, the second and third, most undoubtedly conspire: which we have compil'd, not so much on account of the observations contain'd in these letters, as that (which we hope will not be disagreeable to men of learning) all the observations already extant in the Sepulchretum, or which shall be added to it, with every-thing deserving notice contain'd therein, may more readily be found; and thereby the whole render'd considerably more useful.

The first of these indexes, therefore, shews what has been observ'd in living bodies, the other what in the bodies after death; so that if any physician observe a singular, or any other symptom in a patient, and desire to know what internal injury is wont to correspond to that symptom; or if any anatomist find any particular morbid appearance in the dissection of a body, and should wish to know what symptom has preceded an injury of this kind in other bodies; the physician, by inspecting the first of these indexes, the anatomist by inspecting the second, will immediately find the observation which contains both (if both have been observ'd by us); and this so much the more easily, because where it was necessary to point out more circumstances in regard to any symptom, or the morbid state of any part, each of them are pointed out in a certain order.

Nor will the first of these two indexes only point out the symptoms and the diseases, but other things also which I thought might be very usefully added; such as the previous external causes of disease, the mode of diet, the condition in life, as that of a widow or a virgin, the state of childhood, or decrepid age, and finally the trade or employment in life; so that, again, if any-one should intend to treat of the disorders of any particular class of people, such as of virgins, children, or old men, or, desiring to imitate our Rammazzini, or make additions to his book, should wish to write of the disorders of artificers, he will not only have an opportunity of informing himself, to what disorders those several classes, and they as artificers, or any other set of artificers, are liable, but also what morbid appearances are wont to be found in their bodies.

Nor

Nor have we omitted, in the second of these indexes, to remark, as occasion offer'd, any-thing that relates to the quantity, or state, of the blood, or other humours. And as Valsalva has frequently and accurately told us, what he saw in the lymphæducts, and what experiments he made upon the water extravasated into the various cavities of the body, we have not even omitted to mention these in the fourth index at least.

18. But as all our observations are but few, if compar'd with those contain'd in the Sepulchretum, so these latter will be much more fitted to produce the advantages I have mention'd, if indexes are compil'd from them by any diligent man, and from those which others may publish hereafter by their own authors, almost in this manner. Nor was it extremely difficult, but rather easy, for me to collect all these indexes of mine. For when I had written an observation, a scholium, or an animadversion, each under its prefix'd and immutable number, I immediately put down every-thing, while it was yet present in my mind, in its proper index.

In a long work therefore, and, of consequence, one which the better deserves to be excus'd, if any things have crept in differently from my intention, (and that many errors have crept in it is natural to suppose) being admonish'd by the indexes themselves, I easily avoided repeating any-thing: and by the same pains the very troublesome labour of compiling these indexes after the completion of the work, was provided against, at the same time that care was taken, that, if the work ever happen'd to be reprinted in any other form whatever, the indexes should not become uselefs, but should still continue to have the same reference or effect, as appears from the second edition of my Anatomical Epistles.

There is one inconvenience which may happen, and has sometimes happen'd to me; I mean, the greater prolixity than I would wish of some articles. For as I found it necessary to add other things to them, and that more than once, and yet without disturbing or changing the order of the numbers, which was by no means to be attempted; and as, from the time that, having publish'd the first of my *Adversaria*, and on the one hand observ'd the perpetual and excellent customs of our ancestors, and on the other how much it is prejudicial both to readers and authors, and to both equally, to have their attention call'd from the thread and energy of the discourse, by notes which are subjoin'd; this method, which is now almost universal, did not sufficiently please me; I chose rather to be a little prolix now and then, and tedious to my readers, than frequently to call away their intention from the tenour of the discourse.

But be this as it will, (for I do not altogether disapprove that custom, and even confess of how great an advantage it has been to writers, who have experienc'd, as well as I, according to what I have formerly said (r) with the younger Pliny, how *laborious it is to incorporate new members, as it were, with a body which is already complete, and yet not disturb or change the order of the former*) it certainly cannot happen to observations, that, when we have once put down with accuracy what has been observ'd in the patient while living, and found in his body after death, there can still remain circumstances to be added which may require a great number of words.

And those two indexes relate only to observations, or to that method of compiling them which I have mention'd, or to a better which learned men will point out. And this I earnestly beg and intreat them to do, for the sake of the public in general: nor do I less earnestly beg and intreat of them, that, if they should happen to find any-thing which may not seem so much to deserve their disapprobation in these books, or in this example of an old man such as I am, they will not fail to confirm it by their own very great authority, and thereby add weight to the work, so as to preserve it from oppression and disgrace. For a *discourse*, as Euripides says (s), *which comes from men who are not celebrated, and from those who are so, has by no means the same effect*.

College at Padua, August 30, 1760.

(r) Præfat. ad Epist. Anat. n. 8.

(s) In Hecuba.

C O N T E N T S

OF THE

F I R S T V O L U M E.

BOOK I. Of DISORDERS of the HEAD.

LETTER

- I. *OF Pain in the Head.*
- II. *Of the Apoplexy in general, and particularly of the sanguineous Apoplexy.*
- III. *Of the same sanguineous Apoplexy.*
- IV. *Of the serous Apoplexy.*
- V. *Of the Apoplexy which is neither sanguineous nor serous.*
- VI. *Of the remaining soporific Affections.*
- VII. *Of the Phrenitis, Paraphrenitis, and Delirium.*
- VIII. *Of Madness, Melancholy, and Hydrophobia.*
- IX. *Of Epilepsy.*
- X. *Of Convulsions and convulsive Motions.*
- XI. *Of Paralysis.*
- XII. *Of the Hydrocephalus, and Hydrorachitis.*
- XIII. *Of the Catarrh; and of Affections of the Eyes.*
- XIV. *Of Affections of the Ears, and Nostrils; and of Stammering.*

C O N T E N T S.

BOOK II. OF DISORDERS of the THORAX.

LETTER

- XV. *Of Respiration being injur'd, particularly from Causes that lie on the Outside of the Thorax; and also from such as lie within the Lungs; and especially from Calculi.*
- XVI. *Of Respiration being injur'd from a Dropsy of the Thorax, or Pericardium.*
- XVII. *Of Respiration being injur'd from Aneurisms of the Heart, or Aorta, within the Thorax.*
- XVIII. *Of the same.*
- XIX. *Of Suffocation; and of Cough.*
- XX. *Of Pain in the Breast, Sides, and Back.*
- XXI. *Of the same.*
- XXII. *Of the Spitting of Blood; and of purulent Spitings, the Empyema and Pthipsis.*
- XXIII. *Of Palpitation, and Pain of the Heart.*
- XXIV. *Of Preternatural Pulses.*
- XXV. *Of Lypothymia; and Syncope.*
- XXVI. *Of sudden Death, particularly from a Disorder of the Blood-vessels in the Thorax.*
- XXVII. *Of the same from a Disorder of the Heart.*

LETTER the FIRST.

OF PAIN in the HEAD.

1. **I**N order to perform what I promised you, I will begin with the pain of the head; but do not expect, that I shall include in this letter, all the causes of that pain, which have occur'd to Valsalva, or myself in dissections. Most of them will be recounted hereafter, on other occasions. For this pain, not only attends disorders of the head itself, but is frequently join'd, to those of the other parts of the body. And indeed, of itself alone, it is perhaps never mortal: for which reason, I have but few histories thereof to introduce here, and these only treat of it as preceding other disorders, or as a threatening symptom which attended them. I will first give you an instance of each kind from Valsalva.

2. A boy of thirteen years of age, of a ready wit, whose brother and sister had died of a consumption, having himself labour'd under an inflammation of the left lobe of the lungs the year before, was seiz'd with a pain in his head over his eyes: his eyes were also painful, and troubled with a viscid defluxion. The day following he became delirious; his eyes were fix'd on those about him; and he threw up a little tough phlegm. Then on a sudden, he was seiz'd with convulsions; after which he fell into a kind of lethargy: yet was frequently rous'd by convulsions, attended with difficult respiration. At length he died. When the abdomen was open'd, the viscera were all found to be in a sound state: but the stomach, contain'd a kind of æruginous humour, the bladder was turgid with urine, and the gall-bladder with bile. In the chest, the right lobe of the lungs did not adhere to the pleura; but in the upper part toward the clavicle contain'd a tubercle almost as big as a walnut, in which were little cavities full of matter, that in colour and consistence resembled the medullary substance of the brain. And this perhaps would have given rise to a disorder; had the youth liv'd longer, similar to those which took off his brother and sister. But the left lobe of the lungs, which as I said above, had been inflam'd the year before, was on the back part connected with the pleura. The pericardium contain'd two ounces of serum, and was consequently enlarg'd; and the right ventricle of the heart, had in it a little polypous concretion: yet the rest of the blood was not in the least concreted, although he had been dead seven-

teen hours. Having saw'd open the skull, the dura mater was found ting'd with a cineritious colour, along the sides of the blood-vessels. And when the dura mater was torn away from the crista galli, a little sanious serum burst forth: and about an ounce of limpid serum, came from the origin of the optic nerves. But the whole brain appeared found; and we could not help taking notice of the unusual magnitude of the pineal gland.

3. This last article, which respects the ingenuity of the youth, you will understand was written when the pineal gland was believ'd to be the seat of the soul. As to the disease, it began with the pain of the head and eyes; the delirium, the vomitings, the convulsions, brought it to its acmé, and the same convulsions, it would seem, by bringing on death put an end to it. Nay, perhaps this convulsion though occult, was the beginning of it. Since pain, delirium, and vomiting, might be the effects of slight convulsions: as the turgid state of both bladders, might be the effect of the delirium. For it is usual with delirious persons not to attend to the stimulus of the urine; and to refuse food, which by compressing the cyst would squeeze out the bile. Yet some part of this may have been forced into the stomach by the straining to vomit, and have given the æruginous colour to the ejected humour. The same convulsion also left a sleepiness behind it, the brain being compris'd round about; which sleepiness was frequently interrupted by the returning twitches of the convulsion. But was the serum, found at the anterior basis of the cerebrum, the cause, or the effect of the convulsion? 'Tis no matter which you believe; for whether we suppose that the latent cause of the convulsion, by constringing the vessels and giving a remora to the blood, was also the cause of the serum being effus'd; or that the serum being first extravasated, by irritating the meninges which lie at the lower part of the forehead and round the optic nerves, originally created slight convulsions and pains; the case will be sufficiently intelligible, whichever mode of explication we choose. For it is not necessary we should believe, that because the serum was limpid it was consequently harmless; since it is certain that salts which are the most capable of erosion; by no means affect the pellucidity of water, when dissolv'd. Though, in fact the serum was not altogether limpid, but in part sanious. But how that sanies is to be accounted for, we shall enquire in other histories of a similar nature; whether it was a true sanies, or rather an appearance of it only (*a*). I shall now give you the other history from Valsalva.

4. A man about forty years of age, had been liable many years to a pain in the right hypochondrium, which return'd periodically, often attended with vomitings, and sometimes degenerating into the iliac passion, with delirium. He was also troubled with violent pains in his head, which were almost constant, and join'd with a defluxion of serum upon his eyes. This man having drunk too freely of wine, was soon after attack'd with his usual pain and vomitings. However, he got rid of both these complaints by an unction which an empiric had order'd to be applied to his belly. But he was immediately seiz'd with a vehement heat in his head, both internally and externally: and the same unction being applied to his head, it was at-

(a) Infra numb. 13. & epist. 5. n. 5 & 13.

tack'd with the most violent pain; and this pain was accompanied with a delirium and convulsive motions: which ceasing about an hour before death, or at least not being observable, he became apoplectic, with a difficult respiration, a foaming at his mouth, and a strong full pulse; and in this manner he died. The face of the carcase was pale, and the limbs contracted; but whether this happened from the great coldness of the external air, or from the foregoing convulsion, is uncertain. The pericranium about the finciput, was found much thickened by stagnating juices, which were concreted into the form of a jelly. There was some serum betwixt the pia mater and brain, and some also in the ventricles of the brain. Having open'd the abdomen, nothing appear'd that was worthy of notice, except a little quantity of stagnant serum, and a hard liver.

5. These things which come last in the dissection, answer to those that went first in the history. The hardness of the liver shews that the periodical pain in the right hypochondrium, depended on the state of the viscus; for in such a state it must necessarily secrete a vitiated bile, which when collected in its cyst, would be plentifully pour'd out into the duodenum, and give rise to those pains in that intestine and the parts about it: and these pains by inverting more or less the muscular contraction of the stomach and intestines, often brought on vomitings, and sometimes the iliac passion itself. But when the pain and vomitings, which had become the more urgent as they were the more necessary to carry off the causes of the disorder, when encreas'd by his late drunkenness, were suddenly suppress'd, part of these causes easily seiz'd upon the head which was already weakened by its pains; and this part might possibly have been somewhat dissipated by the heat, had it not been imprudently repelled by the unction: for by this means, the morbid cause became inherent in the nearest membrane without the cranium, in the form of a jelly, and violently distended it; and within the cranium, by breaking in upon the parts mention'd, and by irritating the pia mater where it invests the brain and ventricles, first brought on those severe pains, then delirium and convulsive motions, and at length apoplexy itself. But if you choose to consider that serum as an effect rather than a cause, I shall not contest your opinion.

6. To these two histories give me leave to add a third, which, though it does not relate to a man, but a sheep, is far from being unworthy of our notice. Especially as Boreus in order more fully to ascertain the seats of pain, has given us histories of sheep, and other animals in his *Sepulchretum* (b). This sheep avoided herding with the flock, and every day by intervals roll'd himself upon the earth, nor would suffer his head to be touch'd, but avoided it by all possible endeavours. Valsalva observing this, and being desirous to know the origin of the pain, purchas'd and dissected the sheep; nor did he find any thing morbid elsewhere than in the brain: for when he first took it out from the cranium, a little acidulated water fell from that part, where the mamillary process approach'd to the os ethmoides. But a greater quantity of water was effus'd, when it was pull'd away from the pituitary gland. Then in dissecting the brain, when he came to the lateral ventricles, a follicle ap-

(b) Lib. 1. sect. 11, obs. 8. & sect. 9.

pear'd therein, containing a good quantity of water, being made of a membrane, which seem'd to be a production of the pia mater, except that some very small corpuscles were scatter'd through it, resembling the medullary substance of the brain. The roots of the follicle came out from the bottom of the right ventricle: and wheresoever they were, below this ventricle, there the substance of the brain, both in its medullary, and cortical part, was corrupted all round to a considerable extent. In short, the whole brain was extremely flaccid; nevertheless the disposition of the nerves was as usual. The examination being carried on, that part of the os ethmoides which lies under the mamillary processes, was found to be so much eroded by the continual dripping of water from the brain, as to afford a free passage from the cranium to the nostrils.

7. An observation nearly of this kind you will find in Bonetus's Sepulchretum (c), or rather in the first century of the medico-physical histories of Petrus Borellus, not the thirty-seventh, but the thirty-eighth observation: in this I say rather, because Bonetus has omitted many things in his copy, nor has the other editor replac'd them, contrary to the admonitions of (d) Peyerus; so that by reason of omissions of this kind which I have observ'd, not only in one place, but in many, it were to be wish'd, that we had a new edition of the Sepulchretum, under the inspection of some diligent man, who would be at the pains of comparing the several articles, with the books from whence they were taken. A girl had been long troubled with a violent pain in the crown of her head, in whom Borellus saw an abscess full of the most limpid water, to the quantity of two pints, lying upon the nates cerebri and insundibulum. From so deep and so hidden a place, where the abscess could scarcely be found, did this pain reach principally to the crown of the head; and thus in some measure confirm'd what we have elsewhere observ'd from Malpighi (e), but render'd doubtful what Archangelus Piccolhominus (f) has advanc'd, that pains which are felt at the upper, or lower part of the cerebrum, are seated in the pia mater, which invests the lateral ventricles of the brain; for though this may sometimes be true, yet we must attend to what was just now hinted, that the other parts which lie deeper than the ventricles, and the basis cerebri, are invested with the same membrane also, and even under that; not to mention other things, that the transverse process of the dura mater is produc'd on both sides, quite to the borders of the fella equina; and that in so tense a state, that even on this account, it might be subject to the sharpest pains, either from the irritating nature of an extravasated humour, or only from a quantity of the same preternaturally overloading and distending it. And that other parts of the meninges, may be oppress'd by congested humours, observations, which may be added to this first section of the Sepulchretum, will also show, as for instance, those made by Behrensius (g), and by Preussius (h). For it happen'd to both these gentlemen, that scarcely had the knife reach'd to the lateral ventricles of the brain, but the included humour rush'd upwards with a considerable impetus; so great was its quantity, and so great the force with which it urg'd the sides of the ventricles and

(c) L. 2. f. 1. obs. 46.

(d) Method. hist. anat. med. c. 1 & seq.

(e) Epist. anat. 13. n. 7.

(f) L. 5. anat. prælect. 3.

(g) Act. nat. cur. t. 2. obs. 31.

(h) Eph. n. c. cent. 3. obs. 14. n. 3.

the membrane that invested them! It is therefore not to be wonder'd at, if the pains of the head were vehement to such a degree, that one of the patients ran almost mad with miserable howlings; and that the other, though a woman, was seiz'd with a fury, and threw herself headlong into a well. And Preussius has shown, not only in this, but in two other observations (*i*), that where the pain was altogether on one side of the head, there the ventricle of that side only was distended: and where it affected one side chiefly, and the other in part, there the ventricle of the one side was much more distended with water than the other; and though the water was extremely limpid, it was not the less noxious than if it had been yellowish. For even the most limpid may contain an occult stimulus, as I said above (*k*), and as the history of Cohausenius (*l*) also proves, in which the right side of the cerebrum; and this it was that suffer'd the most vehement pains; seem'd as it were to swim in a great quantity "of acrid, salt, and perfectly limpid serum." Which, in other observations, as for instance that of Jo. Francus (*m*), whether it was limpid or not, seems to have been destitute of stimulating particles, and to have injur'd by pressure only: for although, upon opening the skull, water was universally found, yet the head had been affected only with a dull and heavy pain. But to return to the sheep: it is probable that the pia mater which cover'd the fundus of the right ventricle, had been pull'd away from the substance of the brain, by the gradual congestion of the water, and form'd into a follicle: and that some particles of the brain, which were torn away with it, gave that corpuscular appearance I have spoken of. As to the water, which was found to be somewhat acid on tasting it, this doubtless confirms what has been already advanc'd, that water effus'd within the cranium, may even sometimes act by vellicating, so as to give rise to disorders of the head. But in regard to the corruption of a-part of the brain, and the great laxity of the whole, notwithstanding that the animal liv'd and mov'd at the same time, I shall have a more proper occasion of discussing this subject hereafter (*n*). Last of all, the erosion of the os ethmoides must not be pass'd over without some animadversion.

8. As a passage was open'd in this manner from the cranium to the nostrils, and consequently from the nostrils to the cranium, so if it should have happen'd that any animalcule had been seen in the brain of that sheep, our wonder would certainly have been less, than when we read so many histories collected in the Sepulchretum (*o*), speaking of earth-worms and other worms, flies, and with God's leave, even scorpions, having in every respect their natural appearances, as being found within human skulls, and thence accounting for the pains of the head. But some are without testimonies, some want a more diligent examination, which was certainly needful; and others, if they are compar'd with the books from whence they were taken, will be found to have a different meaning, as that which is produced from Fernelius (*p*). For if you turn to his description, you will wonder that Bonetus has been silent upon some things which ought not to be omitted, especially as the

(*i*) Eph. n. c. cent. 3. obs. 14. n. 1. & 2.

(*k*) n. 3.

(*l*) Act. cit. t. 7. obs. 74.

(*m*) Eph. n. c. dec. 3; a. 3. obs. 72.

(*n*) Vid. epist. 9. n. 15. 16. 19.

(*o*) Sect. hac 1. obs. 116 & seqq.

(*p*) Pathol. 1. 5. c. 7.

description:

description is short; and, if you well weigh in the medical scale, the sense of those things which immediately precede, you will readily acknowledge that those two worms were found without the cranium, in the cavities of the nose. And it is probable that of the worms, spoken of in the scholia which are added to these histories, as discharg'd from the nose, some had liv'd in its cavities; but that others had crept from the stomach into the nostrils, while the patient was asleep. Nor is it uncommon for worms to grow in the frontal sinusses, especially in sheep, by the irritation of which they are much agitated: so that any one before dissection, might have suppos'd this had been the case with the sheep above mentioned, since he roll'd himself in such agonies on the ground. Nay, and that it sometimes happens to men, to have worms form a nidus in similar places, and bring on pains of the head, even the Arabians formerly, after the opinion of the Indian physicians, deliver'd down in their writings, among whom was Avicenna (*g*), who gives the symptoms and the cure of the disorder. And these things are even taken notice of in those icholia; and moreover, we are referr'd to Aegineta, book the fourth, chapter the 57th, as if he there "granted that pains were indeed excited " by worms, but denied that they were generated in the brain." Yet they do not for this reason reject these incredible histories; but rather seek to confirm them from thence (*r*), because, as it appear'd that worms might be generated from putrid matter in the nose, so they did not doubt but the same might happen from an abscess within the skull; being led on by an error easily pardonable in those times, when the ingenious observations of our Vallisneri (*s*) had not yet demonstrated that worms found in the nose of a sheep were deposited by a fly; nor the celebrated Reaumur, in his incomparable history of insects (*t*), had confirm'd it. Since then it is certain, that these worms are carried from without into the nostrils of sheep, and other animals of that kind; and since they are so frequently found in the nostrils of these creatures, but never in their brain, why should we on the contrary believe, that although they so seldom are found to exist in the nostrils of men, they are nevertheless often found to exist in the human brain? For there is not a passage from the nose into the brain of a living person, as there is from the nose to the frontal sinusses; but it is entirely stopp'd up with nervous fibres, and vessels and membranes, so that not even the smoke of tobacco, when drawn up, much less the smallest particle of its finest powder, or the smallest new-born insect that exists, can pass through. And indeed there was formerly a time, when it was affirm'd from dissections, that the powder of tobacco, and much more the smoke of it, had enter'd the brain; and these observations you will in like manner read in the Sepulchretum (*u*). Yet even there you will see that one is rejected as false, that others are differently explain'd, and that all are immediately invalidated by a greater number of dissections of a contrary tendency, that are immediately put in contrast with them; and, if it were needful, many others of the same nature might also be added to these, and particularly from the books of the Cæsarean academy (*x*).

(*g*) Canon. 1. 3. F. 1. tr. 2. c. 3. 7. 31.

(*t*) Tom. 4. mem. 12.

(*r*) Ad obs. 117.

(*u*) Sect. ead. 1. obs. 82. & l. 4. S. ult.

(*s*) Vid. præfatum oper. in fol. tom. 2. p. 4. epist. ad Gimman.

obs. 1.

(*x*) Cæsareæ nat. cur. acad. cent. 10. obs. 89. 9. What

9. What then? you will say; shall we believe that no little animal, no foot, no snuff, was ever found within the cavity of the skull? Indeed, I suspect, that whoever asserts in his writings his having really seen such things, was certainly impos'd upon, either by the tricks of some juggler, by chance, or by his own incautiousness. For you know how deceitful the hands of jugglers are; so that a person who was before aware of their designs, cannot with all his attention perceive, when they insinuate any thing into a place, which they pretend not to insinuate: how easily then may a person be deceived, who is not only not forewarn'd, but intent on another thing? Nor is it altogether unlikely that we may be impos'd upon by accident itself: as little insects may perhaps adhere to the sponge, which is generally us'd to wipe away the blood, upon opening the skull, or to dry up any extravasated humour; and these insects, by the frequent application of the sponge, may be left behind in the brain. But incautiousness would more frequently give rise to such assertions: for instance, when a slender polypous concretion, which is white and round, is taken for a worm; for it is very rare, and very difficult, for a true and living worm to creep so far as into the longitudinal sinus, by the way which I shall mention hereafter; yet in this sinus du Verney (y) asserts, that a worm was found (z), whether he really saw it himself or not. Or the incautious observer may have been deceiv'd by very small and crumbly concretions of matter, such as we often meet with in the male urethra at the orifices of the prostate gland, and even, as I have more than once seen, within the (a) prostate itself; for these particles of matter exactly resemble the moist granules of tobacco, both in colour and form. Or it is easy to conceive, that a particle of snuff, which was lodg'd in the frontal sinus, may have been drawn into the cavity of the skull, by the saw or knife of the anatomist: for it is very certain, that the smallest dust of tobacco may get into the frontal sinus; perhaps may fly in by chance; or drop into it if the head were inverted; but may most surely be driven thither by the force of expiration. Or finally a narrow, winding, and for that reason less observable passage, might happen to reach from an external ulcer, into the cavity of this sinus: and by that means, either in the dead or the living body, animalcules might be transmitted. Other things I designedly pass over; nor indeed is it necessary to bring more arguments, especially on your account, as you are skill'd in the history of insects, and can very well determine from thence, whether weevils, gnats, flies, scorpions, and other animals, can live and thrive, notwithstanding they are shut up in a streight place, altogether depriv'd of air, and without proper nourishment to subsist on. And it is certain, that from the time in which natural history began to be much studied, and the several articles of it to be scrupulously enquir'd into, no more observations of that kind came abroad; or at least very few only, and those believ'd by as few persons. Nor did any discovery of this kind ever happen to Valsalva or myself, though former physicians assert it to have happen'd so often to them: and yet the number of heads which Valsalva has examin'd, is very considerable; and the number I have examin'd myself, is perhaps not much inferior to his. So that, if I should allow any one of these gentlemen to have really seen such appearances,

(y) Hist. de l'acad. R. des Sc. an. 1700. (z) Vid. epist. 24. n. 23. (a) Epist. 44. n. 20.

without fraud or error; you must take it for granted that I do it rather from a reverence for their names, than from any conviction of my own mind. Nor need it surprise you, that after the most severe pains of the head, nothing else be said to appear but a worm, or animalcule found within the cranium, or seen to come out therefrom. For there are many causes of pain in the head, which either lie on the outside of the cranium; or if they do exist within, do not easily, or perhaps at all, fall under the notice of the senses. What if they are not sought after? for instance, when a worm coming out from the nose of a dying woman, is believ'd to have come from the brain; as if it were really impossible, that it should have crept up there from the intestines. What if other causes are sought after, when they have been already found in the brain? and yet the little worms which are observ'd a day after in the water, where a portion of the brain had been macerated, are accus'd as the causes of the disorder. Vehement also were those pains which two worms of the caterpillar kind created, before they were thrown out from the nose; yet those learned men Littre (*b*), and Maloer (*c*), who saw them, did not at all suspect, that they came from the brain; but accounted for them, by supposing that they came from the frontal sinus, into which the very minute egg of the insect had been carried by the force of respiration. In like manner the learned Henckelius (*d*), when he saw two little worms like weevils coming forth by the same way, and freeing the patient from the most violent tortures of the head, judg'd that they had been perhaps drawn up into the cavities of the nose, by incautiously smelling to flowers: for the young of these animals are frequently harbour'd there, and it is not uncommon for us, to apply them close to our nostrils, while we make a full and strong inspiration. And before him Gahrlepius (*e*), when he saw worms discharg'd from the nose with the same good effect, because he perceiv'd they were like those which are generated by flies, made no doubt of ascribing this offspring to a fly. And they were all in the right, because it was their opinion, that these animals did not come from any putrescent matter, nor were generated in the cavity of the skull, but proceeded from the small eggs or rudiments of animalcules, carried from without, into the recesses of the nose. It is not sufficiently agreed betwixt the two celebrated men whom I first quoted, what kind of remedies are to be applied, or in what manner, in order to bring out these worms from the nostrils. And this controversy it is the more difficult perhaps absolutely to decide upon, because the worms are of different kinds in different cases; so that it does not seem possible they should always be allur'd, or put to flight by the same things. But however this may be, it will certainly be of advantage to know from medical histories, by what methods they have for the most part been drawn out; to which histories you will add those things that are extant in the Acts of the Cæsarean academy (*f*), already commended, and those in the *Commercium Literarium Norimbergense* (*g*), but especially what we read in the lectures of the great Boerhaave on his *Institutiones Rei Medicæ* (*h*), where he mentions a girl cured by him,

(*b*) Hist. de l'acad. R. des Sc. an. 1708.

(*c*) Et an. 1733.

(*d*) Act. nat. cur. d. 3. obs. 110.

(*e*) Eph. nat. cur. dec. 3. A. 8. obs. 141.

(*f*) T. 4. obs. 30.

(*g*) A. 1739, Hebd. 21. II. n. 3.

(*h*) Ad. §. 792.

whose pituitary sinusses were all full of worms. But as they chiefly inhabit the frontal sinusses, which is indicated by the pain beginning, and being the most troublesome, in the region of either sinus, especially when join'd with a sense of motion and gnawing; LITTLE therefore judg'd it proper, that if all other assistances fail'd, the aid of surgery should be call'd in, as an operation on the frontal bone was neither difficult nor dangerous. And I do not doubt but he meant to recommend the same operation which Cæsar Magatus formerly us'd, as I have heard from Vallisneri; that is, to trepan the bone quite into the sinus, and to take out the worm, which he had predicted was contained there, to the great admiration of the spectators; and thus he happily rid the patient of the pain, against which all other applications had been of no effect. And if Vallisneri had published the account of this cure from the manuscript of the author, as I hop'd in my *Adversaria* (*i*), I should perhaps have learn'd among other things, not unworthy to be known, whether the same success attended the closing up of the expos'd sinus, that had attended the trepanning of the bone; for how much difficulty there is to bring that about, Cornelius Celsus has already observed (*k*); and after him the surgeons commended by Palsin (*l*); and Palsin himself has also observed the causes of this difficulty, and the great mischiefs that arise from this sinus not being clos'd up; and in like manner that excellent archiater Nicolaus Rosenius (*m*), whom I saw while I was revising this letter; and from him you may select many things to be compar'd with Verheyen (*n*), who seems to speak of the same stage-quack as Palsin; and to be added to what I have already given out (*o*), upon that observation of Celsus. But if you would have further examples of worms found, as they say, within the skull, or thrown out from the cavities of the nose, you will meet with both kinds of them, among those things which Daniel Le Clerc (*p*) has related, and intermix'd with remarks for the most part: of the second kind you will find many among the instances taken notice of, or proposed by John Saltzman (*q*), who has neglected neither to mention the symptoms of them, nor the methods by which they were discharg'd.

10. But I will now give you three observations of my own, which are taken from patients, with whom pain in the head was either the first symptom, or at least, the most troublesome one among others. A beggar man was receiv'd into the hospital, who certainly had long before had a disorder in his head; he had always been silly, but of late so destitute of sense, that he threw away even the bread which he had begg'd. It appear'd he had been much liable to pains of the head, and at that very time labour'd under obstructions of the belly. He dying of a kind of fever which came upon him, his body was brought into this anatomical theatre, in the year 1728, much emaciated, yet not discovering any signs of disorder in the belly or chest, if you except an obstruction of the spleen; but when the skull was sawed through, and the upper part taken off, it was observ'd that the dura mater

(i) VI. animad. 90.

(k) De medicina, l. 8. c. 4.

(l) Anat. du corps hum. l. 2. tr. 4. ch. 15.

(m) Dissert. de off. Calvar. p. 1. n. 28.

(n) Anat. du corps hum. l. 1. tr. 4. ch. 16.

(o) Epist. in Cels. 4.

(p) Hist. lator. lumbric. c. 13.

(q) Dissert. de verme naribus excusso § 4. 5. 6. 11. & seqq.

was firmly attach'd to it on the left side of the forehead; and there for some space this meninx was not membranous, but had degenerated into a middle state betwixt a bone and a ligament, and form'd the figure of an ellipse. Though the cerebellum was soft and flaccid, and the medulla oblongata not very firm; yet the cerebrum I found to be hard, as is frequently the case in idiots: notwithstanding there was a little limpid water in the lateral ventricles, with colourless plexusses, on the posterior part of which a few vesicles appear'd, fill'd with the same limpid water. Finally, something yellow adher'd to the anterior part of the pineal gland, which when compress'd betwixt my fingers, I perceiv'd to have a kind of sand intermix'd with it.

11. These appearances relate to different affections, as I shall shew in the course of these letters (*r*): and that only, to the pain of the head, which was found in the dura mater. For whatsoever the cause might be, whether internal or external, of the dura mater being indurated, almost to the consistence of a bone, though no traces of this cause were obvious to me; yet it is easy to imagine, that as often as the blood, either by its plenty, or by its turgescency, or by its motion being accelerated through the head, put a force upon the vessels going to this part, it must necessarily be obstructed by that impediment to its course, and distend the fibres which surround the vessels of the dura mater. And you will see it is ascrib'd to this cause in the *Sepulchretum* (*f*), that those persons were "subject to the most miserable "head-aches, in whom the two meninges for some space, often two fingers "breadth, had coalesc'd in such a manner with each other, that the mouths "of the vessels were entirely lock'd up." And it is probable that obstacles of this kind, as far as they oppose the circulation of the blood, or other juices, through the meninges, may sometimes give occasion to pains which return periodically; as often, for instance, as a sufficient portion of juices is obstructed, to cause a distension by its weight; and this obstruction will continue, till the fluids being vitiated thereby, shall irritate the meninges, and consequently bring on a contraction of their fibres; yet no sooner is the first portion of these obstructed juices thrust on by this new-excited force, into the narrow, and lateral canals, but a new portion succeeds, and is in the same manner delay'd, and expell'd; to this others also succeed; nor is there an end of the disorder, till the lateral canals are by these repeated impulses, so far dilated, that they no more resist the circulation of the juices. But pains of this kind are generally either the forerunners of a fatal event (*r*), or rarely, and with difficulty, admit of a cure; and the more so, as they more constantly recur at the same hour; perhaps because by this regular return it is prov'd, that the lateral canals more strongly resist the dilating impulse. I remember when I was a young man, I had a patient among my companions, in the place of my birth, by name Lawrence Bagatrin, who had been seiz'd not long before with an external, but very violent hemicrania, which return'd every day at the eleventh hour, according to the method of reckoning the hours among the Italians. Whatever I did, had either no effect at all, or at least only that of shortening and alleviating the pain, for it still return'd at the same

(*r*) *Vid.* viii. n. 13.
(*f*) *Sect.* hac 1 obf. 12.

(*r*) *Vid.* Eph. n. c. cent. 3. obf. 14. n. 1,
& 3. & Dec. 3. a. 7. append. pag. 74. obf. 75.

hour; and if any little error, or irregularity, was committed, it return'd with its former vehemence. Having for many days us'd all other remedies in vain, I at length got the better of the disorder, by means of a slight decoction of the woods; which gently agitating and impelling the circulating juices, threw the patient into sweats, and reliev'd him of his disorder. And Ballonius (u) testifies, that the same method succeeded with him also, in intolerable hemicranias, that return'd every day, at a certain hour. In the case of this young man, there was certainly something hereditary; for his mother, who was more than seventy years of age, had been seiz'd a little before, with so great a pain in her head, that she lost the sight of one eye; yet she was still afflicted with violent pains, which recurr'd from time to time. But as these pains did not begin always in the same place, but sometimes in the vertex, and sometimes within the nose, (so that snuffing up warm milk was of service) and did not return at the same hour, I found more ease in removing the pain of the mother, than that of the son; and being cur'd of her pain, the sight of her eye was by degrees restor'd. Among other things, bleeding was of service to her; but not so much what was perform'd by my order, as what she perform'd for herself, by untying the bandage from her arm in her sleep, by which she lost a considerable quantity: so that nearly the same success attended bleeding, even in a woman of that age, which Valisneri (x) afterwards remark'd in one of sixty. But let us return to the dissections.

12. A young woman, who was the wife of a poor man, and the daughter of an epileptic mother, being extremely hot after a journey in the month of February, was seiz'd with a violent pain in her head, and an acute fever. She had no delirium, but was often reservedly silent; and with these symptoms in three or four days she died. As she gave suck, and yet had her menstrua upon her, bleeding was for a long time deferr'd; but as she grew much worse, and yet the pulse and strength of the arteries was firm, half a pound of blood was taken from her foot, which was quickly and strongly coagulated; but it happen'd that her death immediately follow'd the loss of it. The head was brought into the theatre to finish the anatomy of that year 1738; but not the other parts, as I wish'd. The inside of the skull had a somewhat red appearance degenerating into brown; and the outside of the pia mater, where it cover'd the upper part of the brain, was smear'd over with a yellowish kind of matter, not much indeed in quantity, but spread equally all over; its consistence was somewhat thick, and though it was perfectly inodorous, yet from the whole of its appearance, it seem'd to myself, and to the other physicians and surgeons who were present, to be pus. However, we could not find any where, in the meninges, or cerebrum, which was discolour'd, any traces of disorder, or any place from which we might suppose this matter had proceeded.

13. If it was really pus, shall we suppose that it was taken up, from some other part of the body, by the sanguiferous vessels, and translated to the head, agreeably to what is hinted of a similar case in the Sepulchretum (y)?

(u) Epidem. lib. 2. const. hyem. a. 1575.

(x) Eph. n. c. cent. 5. obs. 7.

(y) Sect. hac 1. obs. 40.

Certainly for this reason, I should have been much more chagrin'd, that I was not permitted to examine the rest of the body, in order to have determin'd the question; had not the rationale of the cases been different, and other histories come under my knowledge, wherein, as in that of Valsalva before mention'd (z), no sanies was any where found but about the brain, which was itself in every other respect sound. Could this pus-like matter then, have its origin from the small, and almost invisible foramina, of the meninges, from which, in a natural state, only a little limpid humour, to moisten their surfaces, is discharg'd? could it be press'd out by the force of the disease, as frequently happens to the glands of the rectum and bladder in the tenesmus or dysuria. Certainly, that the meninges were entirely free from disease, neither the violent pain of the head, nor the colour of the skull, where it was contiguous to the meninges, suffer us to believe.

14. Speaking of that colour brings to my mind the history of another woman, whose head I dissected in the beginning of the year 1717. Being first affected with the lues venerea, and after that with a fever, join'd to severe pains of the head and delirium, she died of this complication of disorders in the hospital at Padua.

Her skull also, when it was open'd, appear'd of a blackish red in some places; and the dura mater, where it lay nearest to the upper and middle region of the lateral sinus on the right side, was much thicken'd, and perfectly coalesc'd with the pia mater, and even with the substance of the brain: the meninges and brain were in that part also semipurid, and glar'd with a very disagreeable colour, which was compos'd of a yellowish, mix'd with an ash-like hue, especially in the cortical part of the cerebrum. Moreover, the external surface of the cerebellum was so firmly connected with the two meninges, that when I drew it out from the cavity of the dura mater, a part of its substance was left adhering thereto. But the extent of the adhesion was not so great as in the cerebrum, as it did not exceed the breadth of two fingers. The vessels of the brain likewise, which creep through the pia mater, were larger than they naturally are, and distended with a black blood, such as was also found in the sinusses of the dura mater. And through the medullary substance of the brain, when dissected piece-meal, the sanguiferous vessels appear'd to be very frequent in several places, and more distinct than usual. The lateral ventricles were full of a brownish water, with which colour also their surfaces were tinged. Finally, the pineal gland was firmer, larger, and whiter than common; and seem'd to contain within it a kind of loculi or cells. I will not, however, conceal a remark, which may be join'd to that curious observation extant in the Commentaries of the imperial academy at Petersburg (a); I mean, that from the birth, or at least from early infancy, the woman had this peculiarity in her skull, that the right side posteriorly, had a larger curve outwards than the left; for which reason its internal cavity, and the hemisphere of the brain contain'd therein, were evidently larger on that side than the other. The same circumstance occur'd to me also in another woman (b), and seem'd the more worthy of attention, because the whole cavity of the skull was made oblique and winding; the right temple being more hollow'd, the left more contracted; and *vice versa*, the right

(z) N. 2.

(a) Tom. 7. p. 222 & seq.

(b) Vid. ut in aliis quoque, epist. 62. n. 15.

side of the occiput being more contracted, answered to the left, which was more hollow'd. But though in this woman also the lateral ventricles were full of a turbid water, yet as this history does not immediately relate to our present subject, we shall for that reason give it you hereafter (c).

15. For I do not know whether this woman had been subject to pains of the head; nor yet whether she whole history was just now related in full, had been troubled with them before she was afflicted with a fever: notwithstanding, I know very well from other observations, "that a misshapen figure of the head is believ'd to be of great consequence, in bringing on obstinate pains;" which words are copied in the *Sepulchretum* (d) also, but the author's name, to wit, Rolsinc (e), through neglect, is omitted. But to return to the history described. If this woman, and the other young woman spoken of above (f) in like manner, had been men, and almost continually employed in smoking tobacco, that brown and almost black colour observed on the inside of their skulls, some would have thought, and especially formerly, very easily to be accounted for from thence; that is, from the foot and dregs of the smoke being drawn up and harbour'd there; nor indeed did they neglect to account for it from thence, as we have shewn by what goes before (g). We however, as some redness was mixed with that colour, did not hesitate to attribute it to the stagnating blood. For though the woman laboured under a lues venerea, yet there was no where any caries in the skull, which from the sharp pains might possibly have been suspected with some reason; although the external surface of the head gave no mark of it either by colour, or tumor. And this is evident from many observations, but especially from that of the beautiful strumpet, which I remember to have heard from Novesio at Bologna, who afterwards publish'd it (h). The thickness then of the dura mater, and its coalition with the interior lamina of the skull, is sufficient to account for the remora of the blood in the small vessels, as we shall shew elsewhere. And I think it is equally sufficient to account for those pains, even from the arguments which were above (i) set forth.

16. And that you may more fully understand, how coalitions of that kind, by being an impediment to the blood, may bring on pains of the head, remember, that as some of the sanguiferous vessels are veins, and some arteries, the blood which is carried through the latter, will, when it meets with an obstacle, whereby its progress is made slower, not only injure, by distending the fibres, but also by encreasing the strokes of the vessels. That is to say, as many arterial pulsations as there are in the meninges, so many strokes will they receive; and these strokes will be so much the greater, as the transit of the blood is more difficult. Thus Brunnerus (k) attributed the violent pains of the head, in a man whose dura mater was beset with many verrucæ of the bigness of a pea, which were scattered up and down, but especially about the ramifications of the arteries, to the several strokes of these vessels; although he considered the force of the distension only, and not of the percussion. However, not only coalitions, by diminishing the capacities of the vessels,

(c) Epist. 12. n. 2

(d) Sect. hac 1. sub obs. 46

(e) Ord. & meth. cognosc. dolorem cap. l. 2. f. 2. art. 1. p. 1. c. 24

(f) N. 12

(g) Lettres l. 6

(h) N. 11

(k) Eph. n. c. cent. 1. obs. 69

(g) N. 8

which

which pass through them, but also whatever by pricking and vellicating, or compressing, can produce the same effects, will give occasion to pains of the head.

By pricking did that sharp bony particle, situated betwixt the meninges, give occasion to pain, of which you will read in observat. iii. an. vii. dec. iii. Ephemer. Cæsareæ Nat. Cur. Academ. And by compressing, that interior exostosis of the cranium, describ'd in observation ccliii. dec. iii. an. x. the blood being thereby so obstructed in the meninges in like manner, that they were almost a finger's breadth in thickness, and had the appearance of fungous flesh: as also that in cent. vi. observ. xxi. which by the remark added to it, does not stand alone; but especially that which is extant in observation xcix. vol. ii. of the Acts of the same academy. And I designedly collect you several examples from the less antient books, because I see that many things from those books which were publish'd before the second edition of the Sepulchretum, have been deservedly transferr'd thither.

17. Nor do we want examples taken from other observators, to add to these; two of which I will mention, as they are not inelegant observations, and are much to the purpose of the above dissection of the woman; for they shew, that too great a quantity of blood distending the vessels within the skull, will create pains of the head. One example is that given by Cowper in his English Anatomy of the human body; or if you have not this book, in the Acta Erud. Lips. (l), and another you will read in the *Commercium Literarium* (m). The first example is of a man, who from his youth had been liable to the pain of which we speak, in a violent degree; and in him the vessels of the dura mater were so distended, as to equal the bigness of a goose-quill. And lest you should imagine that this happened on the attack of the apoplexy, which was his late and final disease, I will prove to you that this phenomenon was of a very early date; for the sulci or beds of these vessels, in the internal lamina of the skull, were so deep and so large, as to answer entirely to the thickness of the vessels themselves. And to this observation you may also add a similar one of Bajerus (n). The second example is that of a woman, who in like manner had been subject from her youth to great pains in her head; and these were always increas'd in proportion to the increas'd quantity or rarefaction of the blood. For in her the right kidney being out of its proper situation, had so compress'd the aorta and vena cava against the lower vertebræ of the loins, that where this vein receiv'd the blood of the left iliac, a varix was form'd, the diameter of which exceeded the diameter of the cava in almost a double proportion: and from this it is manifest, that in proportion as the blood was impeded in its free course to the lower extremities, the greater quantity must have been consequently carried to the upper parts, and to the head itself. And you easily see what these examples tend to prove; to wit, that the quantity of blood with which I saw the vessels of the meninges, and the minute vessels of the brain, distended so as to enlarge their peripheries, was sufficient to account for those severe pains of the head, with which the woman had been affected.

(l) A. 1699 M. Feb. ad Tab. 91

(n) Act. n. c. t. 3. obs. 121.

(m) A. 1744 Hebd. 43. 1

18. As to the other things which the history contains, some, for instance the circumstance of water being found in the ventricles, I have explain'd already (o); and the remaining circumstances will be explain'd elsewhere. For, as I said in the beginning, pain of the head is generally complicated with other disorders. Thus I have given you what occur'd to me at present concerning this disorder: and shall go on to consider others in the same manner, if these first observations should not be disagreeable to you. Farewel.

LETTER the SECOND.

Which treats, first, of the Apoplexy in general; and then in particular of the Sanguineous Apoplexy.

1. **Y**OU tell me, that you was pleas'd with my late letter on pain in the head: but that you expect those which shall relate to the apoplexy, and other disorders in their course, will be so much the more agreeable to you, as the disorders are more grievous, and attended with more danger. You, at the same time, ask, whether the apoplexy be really more frequent in these days than before, since you see two learned physicians of different opinions: and, what is still more wonderful, as you find both of them appealing to Celsus for a confirmation of their opinions.

2. To begin then with this enquiry: It cannot be deny'd that the following passage is found in Celsus (a): *Attonitos quoque raro videmus, quorum & corpus, & mens, stupet. Fit interdum ictu fulminis, interdum morbo, hunc ἀποπληξίαν Græci appellant.* "It sometimes also happens, though but rarely, that we see persons suddenly stricken, so as to have both body and mind render'd utterly inactive. It is sometimes the effect of a thunderstroke, and sometimes of disease; the Greeks call it apoplexy." But neither can it be deny'd, that having just propos'd a very short method of cure for these attoniti, or suddenly stricken, he goes on to subjoin (b), *At resolutio nervorum frequens ubique morbus est. Sed interdum tota corpora, interdum partes infestat. Veteres antiquiores illud ἀποπληξίαν; hoc παράλυσιν nominant.* Nunc utrumque παράλυσιν appellari video. "But a resolution of the nerves is every where a frequent disease. Sometimes, however, it attacks the whole body; and sometimes a part of it only. Antient authors have call'd the first apoplexy: the last paralysis. But now I see, that each of them is term'd paralysis." But do not imagine that this apoplexy, which he says was so common every where, and was at that time us'd to be call'd paralysis, was a palsy of the whole body, rather than a true apoplexy; for you must observe, that not only the whole body was resolv'd by it, so that it might be call'd paraplexia (c), but also that it suspended the action of the

(o) N. 3

(a) De medicina l. 3. c. 26

(b) Initio seq. c. 27

(c) Vid. Galen. apud Gorræum defin. med.

το' II.

(d) Cit. cap. 27

mind: for in his method of cure for this disorder, Celsus(*d*) presently pronounces, *post sanguinis missionem si non redit & motus & mens, nihil spei superesse*; “if after bleeding motion and sense do not return, there remains “no hope;” not to add also, that a paraplexy often succeeds to an apoplexy(*e*); so that if the one is frequent, the other of course cannot be rare. What disorder then, you will say, was that apoplexy first spoken of by Celsus? in which he says, both body and mind were inactive; but that it was seldom to be met with. If Mercurialis(*f*), and other learned men, both before and after him, had not determin’d that to be the true apoplexy, which Celsus there names the *attonitus morbus* (although *attonitus*, as Rubæus(*g*) observes, refers more properly to a person stricken with the disease, than to the disease itself) I should perhaps have taken upon me long ago, to doubt, whether the word ἀποπληξίαν was a corrupt or a genuine one. For I sometimes suspected, even when I wrote the last epistles on Celsus, that some other disorder, suppose the catalepsy, or some one similar thereto, which we see but rarely, was intended by him in that passage: for in the catalepsy both the mind and the body are inactive; and this also happens sometimes from a thunder-stroke, from whence they are properly call’d attoniti, or thunder-struck(*h*). And indeed I hop’d that my suspicion was confirm’d, and that some reasons for an emendation of the passage might be drawn from Cælius Aurelianus; who having treated more largely of the catalepsy(*i*) than any of the ancients whose works are extant, has taught us, who, in the early ages, first separated this disorder from others, and gave it that name; and what method of cure was made use of by each. But being straiten’d for want of time, and delay’d by a kind of inconstancy, which ought perhaps to be attributed to the booksellers; and as I found that it asserted, that Asclepiades “had “called it catalepsy,” and presently, “that he had not given it this new name, “but his followers;” I thought it would take up a great deal of time and pains to discuss the subject; nor was I willing to compare the method of cure of Celsus with that of Themison, who had liv’d some time before. What you will determine upon I can easily guess, not so much persuaded by my own opinion, as by that of the very learned Gerard Van Swieten, who, in justice to his merits, is the ennobled and imperial archiater. For when I perus’d the third volume of his Commentaries(*k*), which was very kindly sent to me while I was revising this epistle, I was rejoic’d to find that he had made the same conjecture with myself; and unless you agree with it, I hope you will find some method to reconcile the difficulty that occurs; which is, that one and the same disorder is seldom seen, and is yet common every where.

3. But that before and after Celsus, the apoplexy was a frequent disorder, not only Hippocrates has shewn, but other observers of diseases have confirm’d; for if this disorder had been but rarely seen, Hippocrates would scarcely have number’d it among the diseases which happen for the most part “in very rainy weather(*l*),” and also “in winter(*m*);” and the other observers also, when they quoted his opinions, not only did not doubt of

(*d*) Apud Goræum loc. citat.

(*f*) Prælect. Patav. l. 1. c. 19

(*g*) Annot. in cit. Celsi c. 26

(*h*) Servius ad v. 172. l. Æneid

(*i*) Acut. morb. l. 2. c. 10. 11. 12. & Chron.

l. 2. c. 5

(*k*) In Boerhaav. Aphorism. § 1007

(*l*) Sect. 3. Aph. 16 (*m*) Ibid. Aph. 23
their

their truth, but even confirm'd them by their own observations. Thus Hollerius (*n*) gives an account of many whom he saw become apoplectic, "in a cold and damp state of atmosphere." Thus, not to be too prolix, Forestus (*o*), after producing his observations, says, "the whole state of weather was at that time rainy, attended with southerly winds; and from the beginning of December to the eighteenth day, many died apoplectic and convuls'd." And indeed he has in general asserted, "that in his moist and cold regions of Holland, the apoplexy was not rare, but even very common; common also in places which were cold by their natural situation; as at Florence, Luca, and Bologna," where he had studied for some time; "and also in Germany and Britain, from the nature of the climates." And these two physicians had observ'd these things about a hundred and fifty years before the beginning of the present age; or if Forestus was a little later, Jacchius (*p*) certainly was not; and from him many of these things are set down in his own words, though Forestus conceal'd his name.

4. But do not believe, that I say these things in order to disavow what I very well remember; I mean, that about the beginning of this age sudden deaths were so common, that the people were astonish'd and terrify'd with the novelty of it. But this I say, that it has happen'd in our times, and in other times also; sometimes at longer, and sometimes at shorter intervals, as the nature of the seasons has admitted; and not only of those which are mention'd for the sake of example, but of others also, as I shall shew on a proper occasion (*q*); and that more or less, according to the situation and constitution of the countries, and the manner of living more or less agreeably to the seasons. There even was a time when, among other pestilential disorders, which were perhaps the consequences of a noxious air from the adjacent places; and certainly of changing a laborious life into an idle and luxurious one; "that most severe disease, the apoplexy," rag'd also; as you will learn from Agathia (*r*). Who also describing another pestilence in the same sixth century (*s*), after enumerating other kinds of death, says, "that a great number died of a sudden likewise, as if they had been seiz'd with that dreadful disorder the apoplexy." Then add this also, that not all the sudden deaths at the beginning of our century, were the effects of apoplexy, but many were from syncope, and some from suffocation. Last of all, I assert, that of the many who died of an apoplexy in the same month, or even in the same day, all did by no means discover the same injuries in the brain; but some of these appearances were widely different from others, and proceeded from different causes; and some of them were not recent, but of long standing, as foregoing symptoms had testified. And this being in like manner observ'd from dissections, gave much ease to the minds of those, who were ready to attribute the great frequency of sudden deaths, to some common cause which lay hidden in the air.

5. For although the proximate cause of every apoplexy, and that which contains the disease, seems to be one; that is, a sudden diminution of the internal motions perform'd in the brain, to wit, when we move, think, or

(*n*) De Morb. Int. l. 1. c. 7. in Schol.

(*o*) Observ. Med. l. 10. obs. 70

(*p*) Vid. Init. c. 9. Com. in Raf.

(*q*) Epist. 3. n. 13. 29

(*r*) De Bello Goth. l. 2

(*s*) l. 5

perceive : and though this imminution is sometimes so great as to approach almost to a cessation, or immediately to degenerate into it; yet there are many and various causes that bring it on, some of which entirely escape the notice of the senses, though others fall under their observation. And we will endeavour, as far as we can, to form a conjecture about the former of these causes, where the case shall sometimes compel us. But, at the same time, I shall spare no pains to describe clearly, and distinctly, those which are generally manifest, and appear within the skull.

6. These last-mention'd causes, for the most part, exist, either in the blood, or the serum, though sometimes they are otherwise applied. But we will pursue the two more frequent causes first; and leave the more rare to be consider'd in the last place. For this being frequently observ'd, gave rise to that celebrated division of the apoplexy into sanguineous and serous: and they who have disapprov'd this division, have done it, I suppose, partly for this reason; because they should then consider the continent cause, more than the efficient causes, and the advantage proceeding therefrom in the prognostication and cure; but partly also, because they did not consider the effusion of serum as a cause, but as an effect. Though of this matter I have already spoken (*r*), and will again speak; and I believe that one reason for rejecting it was, because they wish'd to explode all the opinions of the antients: and with them this dogma was perpetually inculcated, that apoplexies in general had their origin from too viscid a serum, in the ventricles of the brain. But doubtless the prejudices of the moderns, against antient doctrines, have often carried them too far beyond proper bounds.

7. Yet the more learned physicians have by no means been ignorant, that even the fathers of physic acknowledg'd an apoplexy from a sanguineous cause; though the greater part of them believ'd the contrary. I shall not bring quotations from Hippocrates and Galen, for you have them in the *Sepulchretum* (*u*), as also the words of Turrifanus (*x*), who, in the fourteenth century, shew'd that such a passage existed. And others, in the fifteenth and sixteenth centuries, especially among the Italians, went on to do the same. Among these, were Jo. Matthæus de Gradi (*y*), Jacobus Berengarius (*z*), Leonardus Jacobinus (*a*), but particularly Petrus Salius my neighbour (*b*), in the whole of that separate chapter, which he entitled, "Of the sanguineous apoplexy." Although some of these understood the thing differently from others, yet perhaps none of them, except Salius, believ'd that the disorder was brought about in the manner we generally see it, and as I have frequently inculcated; and he himself even thought it happen'd but rarely. Yet Avicenna (*c*) formerly advanc'd this doctrine, to wit, when he pronounc'd that the cause of the second, and more frequent kind of apoplexy from repletion, "was either a sanguineous humour, effus'd suddenly about the ventricles, or a phlegmatic humour, which for the most part gave rise to the second species of apoplexy." But a little before Salius wrote, another Italian, Leonardus Botallus, and Ludovicus Duretus, a Frenchman, though his book

(*r*) Ep'ist. 1. n. 3. & Epist. 4. passim.

(*u*) l. 1. S. 2. in Addit. in Schol. ad obf. 1

& 14

(*x*) Ibidem

(*y*) Prax. tr. 2

(*z*) Isag. ubi de Anat. part. colli.

(*a*) c. 9. cit.

(*b*) c. 2. de Affect. particularib.

(*c*) Canon. l. 3. F. 1. tr. 5. c. 12

was publish'd somewhat later, had seen the blood effus'd about those ventricles of apoplectic bodies, as the words of both which are quoted in the Sepulchretum (*d*) evidently shew; so that it is altogether amazing, that Caspar Hoffman (*e*), who was in every other respect so learned a physician, should ask, "Who ever saw the ventricles fill'd with blood in an apoplexy?" Moreover, Prosper Martianus (*f*) thought, that the apoplexy happen'd so frequently, from blood, not extravasated, in the ventricles, or somewhere else within the cranium, or at least from some other cause, beside a cold humour; that he did not hesitate to affirm, "that of the three species of apoplexy, "one only, and that rarely seen, was to be ascrib'd to the cold juices, according to the opinion of Hippocrates." To this you may add, that Variolus (*g*), writing to Mercurialis, had appeal'd to the dissections of those persons who die apoplectic; and in consequence of his own dissections, spoke thus: "In the ventricles of the brain of apoplectic persons (I hope you will believe me) no greater quantity of excrementitious matter is found, than "is commonly found in those of others:" and this, consider'd with the former testimonies, will plainly convince you, that not only before the more modern times, there were some who allow'd of a sanguineous apoplexy, but that there were even some who asserted, that an apoplexy very seldom, I will not say never, ow'd its origin to excrementitious ferocities effus'd in the ventricles.

8. However, that this disorder is at one time to be accounted for from blood, and at another from serum, is not only confirm'd by the many observations collected in the Sepulchretum, but also by many others publish'd since the second edition of that book; and these I shall mention hereafter, as occasion may require; but at present shall speak only of what were committed to writing, at the same time with those of Duretus and Botallus; and in France likewise, by an Italian physician, as he seems to have been, and whose other observations certainly very well deserve to be publish'd, by the very learned Targioni, as he was certainly no common, but an eminent man, as we may judge from these remarks of his given us by Targioni (*h*). "In the dissection of Madam de Mauvoisin, who died in child-bed, apoplectic and epileptic at the same time, I observ'd that the whole left ventricle of the brain was full of a watry blood, serous, putrid, and discolour'd, and that the veins of the plexus retiformis, together with the arteries, were tumid, as if inflated, and of a black colour: as also in Monsieur de Boyfly, great shield-bearer of France, the whole right ventricle was moisten'd with blood. "Therefore, it is not without reason, that Lampridius says of Severus Cæsar, that he died from a stroke of the blood, which they call an apoplexy; for in most who die of apoplexies, we see extravasations of blood in the ventricles." Nor would I have you displeas'd to find that he has, in making a memorandum for his own use, happen'd to forget names, and has set down Severus instead of Lucius Verus, and Lampridius instead of Sextus Aurelius Victor, whose words in the epitome, concerning Lucius, are these (*i*), to

(*d*) Sect. cit. obs. 11. n. 2 & obs. 16.

(*e*) Vid. Schol. ad cit. obs. 11

(*f*) Annot. in Hippocrat. de morbis 1. 2. ver. 64.

(*g*) De Nervis optic. Epist. 2

(*h*) In fine della Descriz. d'un Tumore Pollic.

(*i*) Hist. Aug. Epitom. in M. Antonia.

wit, that he died “ of a stroke of the blood, which disease the Greeks call “ apoplexy :” from whence you will understand, that even in the fourth century, the sanguineous apoplexy was known ; or, if you are in the number of those who ascribe this epitome to an uncertain author, turn to Eutropius’s history (*k*), which was written in the fourth century also, and before the epitome, and you will read, that Verus died “ suddenly, stricken with blood, “ a falling disease which the Greeks call apoplexy.” And that the disorder of Verus was, in effect, no other than a sanguineous apoplexy, is prov’d from what Julius Capitolinus (*l*), in the third century, had said of his life, disease, method of treatment, and death. For after describing his banquets and his plate, he says, “ that he was seiz’d suddenly, as he was travelling near “ Altinum, with the disorder call’d apoplexy ; and being taken out of the “ vehicle, and let blood, he was carried to Altinum, where, after lying three “ days speechless, he died.” And with this passage of Capitolinus we must not omit the remark made by Egnatius (*m*) a little above, where the same historian had mention’d that apoplexy of Verus ; as it will make us more and more understand, how frequent a disorder it was in the sixteenth century : “ The apoplexy,” says he, “ being a very frequent disease among the people, in those years wherein these commentaries were written, by reason of “ the immoderate use of wine and venery.”

But I return to prove the existence of serous apoplexies ; and that from the writings of the same observator, who has assur’d us, that in most apoplectic patients he saw blood pour’d out into the ventricles. For these words are intermix’d with those given above : “ In others who died of apoplexies, “ I saw the ventricle full of the most limpid water ; whereas in a natural “ state it is entirely empty.” And the existence of the two species will be equally confirm’d, by the observations which you will see taken, first from Valsalva’s papers, and then from my own. Yet I will not do here what is done in the Sepulchretum : that is, I will not mix with these disorders those which were the consequence of wounds and blows on the head ; but will defer them to a more proper opportunity : and those which were publish’d before, by either of us, I shall only refer to. Yet even with these omissions, this letter would be very long ; unless we should give you, at present, only the greater part of the dissections which relate to the sanguineous apoplexy ; and leave the remainder of them, and those that relate to the serous, to be subjects of a future letter.

9. To begin with a great man ; whose history is for that reason more accurately describ’d by Valsalva : The Cardinal Antonio Francesco Sanvitalis was of a moderate stature, or somewhat taller, of a full fleshy habit, and a florid colour : he had been much given to study and close application ; was also subject to the gout, and had some years before been attack’d with a certain ineffectual irritation of the fauces, to spit : and beside this, he was also troubled at intervals, with convulsive motions in his feet and hands. Finally, when he was five-and-fifty years of age, having liv’d for two months together in a mountainous country, on which the four winds generally blew, and the air of which he had at other times found extremely inimical to him ;

(*k*) Hist. Rom. l. 8. (*l*) In Vero Imperat. (*m*) Annot. ad Capitolini M. Antonion. Philos.

and being also troubled with cares and anxieties of mind, and the winter solstice of the year 1714 being at hand, he fell into a vertiginous disorder; after which, although he was freed therefrom, he shew'd a constant sadness, and propensity to sleep. Within about twenty days the vertiginous disorder return'd, and brought a vomiting with it. Yet both these were in a short space remov'd, and after that a violent pain of the head, which had succeeded them. But the day following, at the same hour on which the vertigo had seiz'd him, all sense of feeling and power of motion was lost in the left part of his body, and he lay as if overcome with a profound sleep. His respiration, however, was natural; but his pulse frequent, large, and vehement; and though it was in vain to irritate the left limbs, yet the same irritations being applied to the sole of the right foot, and the usual ones to the nostrils, he was somewhat rous'd, so as to say many things by signs, and some even by proper words. But these irritations had a happier effect after blood being taken away; more especially on the sixth day from the apoplexy, when the right jugular vein was open'd by Valsalva's order; for about four hours after, his internal senses were awaken'd; and his speech, for more than an hour, was restor'd. The same change happen'd, about the same hour, on the following night, and was more evident, and of longer duration. But this rousing was his last: for from that time he gradually declin'd; and was seiz'd with convulsive motions on his right side, especially in his hand and foot: his whole face was likewise convuls'd, but especially about his eyes, and perhaps the heart itself; for he frequently at the same time lay entirely without pulse. In fine, these symptoms recurring about the beginning of the tenth day, he died.

In the belly and chest every thing was found in a natural state. The brain, however, was flaccid; and in the left ventricle was a little serum; but the right contain'd more than two ounces of coagulated blood. The plexus choroïdes was here torn through, and the parietes of the ventricle, even on the external side, toward the back part, were corroded into the form of a deep ulcer.

10. Many things concurr'd to dispose this great man to an apoplexy: studies, close applications to important businesses, anxieties of mind, and even the gout itself, which often draws after it a calculous, and at other times an apoplectic, affection. In reading histories of this kind, please to observe, among the rest, those of a prince, and a count, both of whom were gouty, both apoplectic (*n*): and besides cystic calculi in each, the lateral ventricles of one were full of serum; but those of the other, which is more to our present purpose, were full of extravasated blood. Many of those common signs which Cælius Aurelianus (*o*) formerly collected, foretold the apoplexy of the cardinal, to wit, the convulsive motions of the hands and face; and even, as I think, the convulsive motion of the fauces too: next to these, the repeated vertiges, which were follow'd by a proneness to sleep, sadness, and a violent pain of the head; which so far proclaim'd the approach of an apoplexy, that the last vertigo may be in some measure taken for a kind of slight apoplectic paroxysm, inasmuch as a more heavy one succeeded it on

(*n*) Eph. N. C. Cent. 4. obs. 169.

(*o*) Acut. Morb. l. 3. c. 5.

the following day, at the same hour. That this apoplexy was sanguineous, the quantity of blood, demonstrated by the florid colour, might have shewn, as also the rarefaction brought on by the south winds; the vessels, now growing rigid with age, being presently streighten'd by the winter, and on both these accounts made easily liable to rupture. Nor yet was the apoplexy violent in its beginning or progress; as the natural respiration, and the power of feeling and moving, not being wholly taken away, even on the left side, concurr'd to shew. This was also testify'd from the speech, together with the internal senses, being once, and again, and even a third time restor'd; 'till at length, a laceration in the brain being encreas'd, and the blood more effus'd, the disorder became fatal. Nor was the febrile pulse of the least advantage, though it attended from the very beginning of the disorder: nor yet the fever itself, if you will allow me to suppose what, I think, the remission and exacerbation, sometimes observ'd at the same hour, did in some measure shew. I will even venture to say, that it was of great disadvantage, by strongly agitating and impelling the blood: so that among the many and various things given out by the interpreters of Hippocrates, and other antient as well as modern physicians, of a fever succeeding an apoplexy, this seems to claim the first place here, that although, in the serous apoplexy, it may sometimes be useful, yet it is rather hurtful in the sanguineous; and the very experienc'd (p) Werlhof has affirm'd, that an apoplexy is rarely solv'd by a succeeding fever. But on the other hand, blood-letting had all the advantage it could possibly have, especially from the jugular vein; and that the right too, as Valsalva, who flew from Bologna to the cardinal, has laid down as a maxim, taken from his observations on patients afflicted with a hemiplegia (q), and as dissection also at that time confirm'd. For the mischief was in the right side of the brain, whereas the left side of the body was resolv'd; which you will find was also the case in the dissections that follow. But I would have you observe, that in opening the jugular vein, Valsalva took care, that what has been objected to many who use that remedy in apoplexies, should not be objected to him: that is to say, he took care, that the difficulty of respiration, already so noxious to patients of this kind, inasmuch as it resists the return of the blood from the brain, should not be encreas'd by a bandage round the neck. Or if by the method which the celebrated Heister (r) recommends, a more lax bandage be drawn downwards to the chest, so as to compress the jugular veins, and leave the aspera arteria free; yet he was aware, that even this pressure impedes the return of the blood: and the manner also at present approv'd of by some, which Berengarius Carpenfis (s) formerly describ'd, could not take place in an apoplectic person; or if it should be made use of, it would not only by confining respiration obstruct the blood that was descending from the brain, but by means of the girdle with which the belly is constring'd, would cause much more blood also to be carried to the head. Valsalva, therefore, order'd the jugular vein to be open'd in apoplexies, not only preserving the natural respiration, but also taking care to have the quantity of blood dimi-

(p) Vid. *Commerc. Litterar.* a. 1734. hebdomadae 49. in fin.

(q) *Tract. de Aur.* c. 5. n. 8.

(r) *Instit. Chirurg.* p. 2. s. 1. c. 7. n. 1.

(s) *Isagog. in Anat.* ubi de anat. aliquar. part. colli.

nish'd by prior venæsections. So that there was less danger now from the compression of the jugular, (though the compression of the finger only, I know, is us'd at other times) than hope from its incision; and there was less reason to fear, lest a straighter bandage should be afterwards necessary to compress the orifice of the vein. For as to its being moreover objected by others, that though it indeed be true, that by opening the jugular vein, blood is immediately drawn down from the brain, yet that so much the more is, for this very reason, carried up thither by the carotid artery; certainly Valsalva was by no means ignorant, that the external jugular, which we open in the neck, does not immediately bring back the blood from the brain, but the internal, which we cannot come at to open. He knew also, that the internal carotid artery, which carries blood to the brain, did not answer to the external, but internal jugular; and that the external carotid, which goes to all parts of the head, situated on the outside of the brain, corresponded to the external jugular; and that consequently, as upon this vein being open'd, the resistance of the blood, flowing to these external parts, is taken off, more blood is of course carried by the external carotid, and less remains to circulate through the internal to the brain. Nor am I here afraid lest you object, that there are some communications betwixt the external and internal jugular; for you see it does not for this reason happen, that blood is immediately drawn down from the brain: and still less, that it is drawn in so great a quantity, as must necessarily happen, if it were allowable to open the internal jugular; for the internal jugular is a continuation of those sinusses, in which the whole quantity of venal blood from the brain is collected, and has a much greater diameter than the external; not to say, than some little branches of the external, which I have affirm'd to communicate with those sinusses. And among these branches, if you please, you may reckon the occipital vein; for you will find, that on account of this immediate communication, I have recommended (x) taking blood from this vein, in many disorders of the brain; but especially in a certain obstinate lethargic disorder, as the celebrated Heister (u) has observ'd. But I would not have it understood, that bleedings or cuppings from small veins, are by any means to be compar'd with bleedings in the veins of the arm, or jugular, in the cure of a sanguineous apoplexy: and this caution I give, because some will, perhaps, be led to imagine it from the reading of Hoffman (x). Hoffman, however, did right not to neglect to mention this kind of assistance, as it was so much approv'd by Soranus, as I afterwards observ'd (y), "in complaints of the head;" and by that eminent physician Ingrassia, "in hot affections of the brain;" and since it is sometimes necessary even in the apoplexy itself, as you will gather from the observation of Zacutus, which I formerly pointed out. For by means of two deep scarifications and cuppings in the occiput, he restor'd an apoplectic young man, who had so feeble a pulse, that his death seem'd at hand, and who was incapable of dispensing with any more violent remedies. Mead (z) also, the illustrious English physician, confirms "the very great utility" of

(x) Sect. cit. c. 5, n. 2.

(u) Adv. Anat. VI. animad. 83.

(x) Medic. Rat. t. 4. p. 2. f. 2. c. 7. Thes.

(y) Epist. Anat. 4. n. 11.

(z) Monit. Medic. c. 2. f. 1.

Therap. § 3.

VOL. I.

this practice; and says, that "having made the experiment in several cases of the most dangerous apoplexy, it had greatly alleviated the disorder." But no body has treated more copiously and accurately of this remedy, than the celebrated German professor Aug. Fred. Walther, who, as well as Mead, always testify'd great humanity towards me. This gentleman, in his Dissertation "on the scarification of the occiput, and its use in many disorders of the head," when he mentions its utility in other disorders, among which are the phrenitis, the paraphrenitis, convulsive and lethargic diseases, and the epilepsy itself; as also long-continued *ophthalmies*, angina, vertigo, and obstinate head-achs, though from the beginning sympathetic, so that they are but from the blood; mentions also the use of it in sanguineous apoplexies, and proves it from the observations of others, but especially from his own. And besides these two modern authors, I would refer you on this head to Aretæus (*a*), that great master of healing among the antients; who gives us this admonition as to the method of cure in apoplexies: "When the disease is long protracted, and the cause is in the head, cupping-glasses must be fix'd to the occiput, and blood must be plentifully drawn; for this application is of more use than venæsection, and by no means reduces the strength, &c." But let us return to the observations of Valsalva.

11. A man of sixty years of age, of a sanguineous temperament, and endow'd with a good habit of body, by accident had a fall in walking, and struck his head violently against the ground. Being slightly stupid, his forehead being bruise'd, and blood gushing out from his nostrils, as also a palsy of the left arm having follow'd these symptoms, so that neither sense nor motion remain'd in it, he was brought into the hospital of Sancta Maria de Vita at Bologna. He had a full red colour in his face, a laborious respiration, a hard and moderately quick pulse; but in every other respect there was no preternatural appearance, except the paralysis already spoken of. On the fourth day he was speechless; on the beginning of the fifth he died. In the belly and chest every thing was natural: the os frontis bore no mark of injury, that the senses could perceive; though a little blood was taken away from between the teguments and bone, which had stagnated there from the contusion. Upon opening the skull, the dura mater shew'd only a slight mark of contusion, which did not reach to the pia; but in the right ventricle of the brain, about two ounces of extravasated blood were found concreted: and the corpus striatum, with a part of the plexus choroides, was so much eroded, that scarce any vestige of it remain'd.

12. Do not imagine, that when I introduce this history here, I forget my own resolution; and that this should be rather related with those which derive their origin from blows of the head. It is true, that those histories also, as you will see in the proper place (*b*), surprisngly confirm the observation of Valsalva in *hemiplegias*, which I mention'd above (*c*); but I do not want them at present. This history, however, I transferr'd into the present letter, because his opinion and mine of this apoplexy are different. Nor do I attribute it to his accidental fall, but the fall to it; and I am induc'd by the

(*a*) De Morb. Acut. Cur. l. 1. c. 4.

(*b*) *Æpist.* 51.

(*c*) N. 10.

argument, which Laubius (*d*) should not use, to determine a similar question, in almost a similar case. That is to say, my argument in the case before us, is from the nature of the mischief, which lay hid in the brain; and from its likeness to that which you have read of above. From both of them a fatal apoplexy at length happen'd, as above explain'd (*e*); but the former disease was the more slight; as the latter not only entirely took away the power of feeling and moving in the upper limb; but seems also to have taken away, for a little time, the power of moving, at least, in the lower: so that, in the beginning of the disorder, the man must inevitably, and suddenly, fall. But however you may determine on this question, you will see that the doctrine, for which Valsalva was an advocate, is always confirm'd by this observation. But I will give you still a stronger argument of this, from an observation of Valsalva's.

13. A woman of seventy years of age, had for many months declin'd in her memory; nor did she always see objects, when plac'd in a certain position; and as she walk'd, scarce rais'd her feet from the ground. She having been seiz'd a year before with a sudden disorder of her head, had, by good fortune, immediately recover'd: but now she fell down suddenly, as she was eating; and became paralytic on the whole left side of her body, and in her right arm. Her respiration was altogether natural, and nearly so the colour of her face, which in her was pale, nor did any convulsions appear; but her head fell just like that of a dead person; nor did she give any sign of understanding or feeling, unless that when an incision was made into the jugular vein, she in some measure, contracted herself. She liv'd nine hours. The ventricles of the brain were found to be fill'd with a fluid blood, and the right was very much eroded, as well about the external margin of the corpus striatum, as of the thalamus nervi optici; but the left about the thalamus alone, and that slightly. The plexus choroides could scarcely be observ'd. The other parts were all found.

14. You see that the brain had the least injury on that side on which the body was most resolv'd; and on the other hand, that on the side where the brain was injur'd most, the body was least resolv'd; and the mischief done to the thalami of the optic nerves, corresponded to the defect of vision. But some other things may be gather'd from this history. Petrus Salius (*f*), indeed, the better to distinguish a sanguineous apoplexy from that which has its origin from cold humours, has given us many marks, for this purpose, which are by no means contemptible; unless any one should forget, that marks of this kind are not to be consider'd apart from each other, but that most of them are to be consider'd in conjunction. For they who had attended only to these things, "that if a person labouring under an apoplexy, "be old, or be a woman; if there be not a redness, but paleness in the "countenance, the disorder is from cold humours;" would have been much deceiv'd in this pallid septuagenary. And these things I observe for this reason, because I remember, that when a nun of eighty years of age, who was related to me, was seiz'd with a slight apoplexy, which threaten'd a more violent one, I, though a young man, did not hesitate to agree with that phyfi-

(*d*) Eph. N. C. Cent. 9. obs. 63.(*e*) n. 10.(*f*) l. et c. cit. supra ad n. 7.

cian, who thought blood-letting, and the more temperate remedies, should be made use of, rather than agree with others, who, disapproving this treatment, inculcated a contrary method of cure. These gentlemen consider'd the age only; but we consider'd the other signs which indicate a sanguineous apoplexy. The event vindicated the resolution; for by this method the patient was once and again restor'd: and this method might have been more strongly defended, against those who dissented from it, if the observation of Lancisi (*g*), made upon a merchant of a great age, had been then publish'd. This merchant had very grievous symptoms of an approaching apoplexy, which were much alleviated by a loss of blood from his nose, to the quantity of eleven pounds: and after fifteen days, he was entirely cur'd, by the return of this hæmorrhage, to the quantity of four pounds. In respect to those two also, of whom we have written before, and as many, of whom we shall write presently, if you had attended to their age only, you would have deny'd that the disorder was a sanguineous apoplexy. And it has even happen'd, that out of twenty-three observations, made by Valsalva and myself, which now lie before me, if you reckon those two produc'd in the Anatomical Epistles (*b*), there are to be found in them all, but just three cases which relate to youths, and four which relate to middle-ag'd men. And though it is more frequently true, that the apoplexies of old men degenerate into long-continu'd palsies, and those of young men are soon mortal: yet I have seen the contrary happen in both cases, and that not rarely. And that those are the most violent, and much the soonest mortal, which have their origin from blood, extravasated within the cranium, we not only have daily proofs of ourselves, but it has also been frequently observ'd by others. But not those only are mortal, nor all of them, or certainly not at all times of the disease. For the woman whose history is last describ'd, liv'd only nine hours: yet the great man, of whom I first wrote, was preserv'd to the tenth day. So that the effusion of blood does not seem to have happen'd on the first days of the disease, but rather on the last, as I said above (*i*); and therefore it seems, that the apoplexy at first was not violent, as I have confirm'd by the state of the symptoms, and especially by the natural respiration. For you know, that the principal criterion, by which physicians determine the stronger or weaker degrees of apoplexy, is the greater or lesser change of the respiration from its natural state. Although, by way of proof that scarcely any thing is perpetual in medicine, you see, that in the case of this woman, the respiration was not only "equable and regular," as in another woman distress'd by the celebrated Veratti (*k*), which case should be compar'd with this; but that it was altogether natural. And in the old man, whose history I am about to relate, you will be able easily to judge, how late after the effusion of blood into the ventricles of the brain, death follow'd.

15. A certain old man, long before death, had been seiz'd with an apoplectic disorder, and from thence the whole right part of his body had remain'd paralytic. His skull being open'd after death, the inferior part of the left ventricle was found corroded, together with its plexus choroides,

(*g*) De Subit. Mort. l. 2. c. 5. n. 8.

(*b*) XIII. n. 19. & 25. (*i*) n. 10.

(*k*) Comment. Bonon. Sc. Acad. Tom. 2. P. 1. in Medicis.

about which were polypous concretions of blood. So that this apoplexy seem'd to have had its origin from the corrosion of both these parts, and from the blood that was consequently pour'd into the cavity of the ventricle.

16. If Valsalva, in this history, seems to write wonderful things; how much more wonderful must they seem, which are related in the *Sepulchretum*, and taken from Wepfer (*l*), another very grave writer. In a certain noble Pole, "without apoplexy, or any other grievous symptoms," not only within the cranium and meninges, but also, as he says, "in the very substance of the brain itself, blood was extravasated, without any disorder being the consequence." "But with reason," says the person who copies it, "do we," as Wepfer himself does, "put such things in the catalogue of those that are most rare." Yet Brunnerus (*m*), a man of solid judgment, in the case of a woman whom he had cur'd of an apoplexy almost five years before her death, did not doubt to collect arguments, either from what he had observ'd in her life-time, or what appear'd in her brain when dead, which induc'd him to believe, that blood was even at that time effus'd into the substance of the brain. For in one hemisphere he found "three little caverns, which had been long form'd, lying round about the corpus striatum, now grown callous, and cover'd over with a cicatrix; the whole hemisphere being for that reason flaccid, of a dark yellowish colour, and appearing shrivell'd, as if from an atrophy." and I would have you observe with me, that some things similar to this occur'd to those worthy men, Anthony Leprotti and Jano Planci, who were in the number of my friends. For this is part of a letter that Planci wrote to me on the first of April, in the year 1721, from Rimini. "A few days ago we dissected the body of that man, who consult'd you last June at Padua, upon a hemiplegia, which had remain'd in his left side, from a violent fit of apoplexy. Yet he did not die of this disorder, but from a dilatation of the heart and precordia, which you, from the remedies you so aptly prescrib'd, seem to have been sensible of at that time. But the right hemisphere of the brain, towards the temple, seem'd to have been eroded with a kind of abscess; for there the substance of it was wanting to about four inches in breadth, and an inch and half in depth. And the thalamus nervi optici, on that side, was less by two thirds, than the left: besides, it was of a dun yellow, and appear'd to have been clos'd by a cicatrix." Nor, indeed, was I myself without a particular observation of this kind, before I read over again this letter, when sent back by you; and this I shall send you, with some others (*n*). And, indeed, I also happen'd to light on an observation of Jo. Wilhelmus Albrechtus (*o*), in which, under the cranium, that had been depress'd thirty years before, but never perforated; and under the meninges, which were unhurt, he found a pit or cavity in the brain sufficient to receive his finger; a remarkable portion of the medullary substance being consum'd. And as this could not happen without a laceration of the sanguiferous vessels, he does not doubt, but that the extravasated blood, or purulent matter, was by the mere assistance of nature reabsorb'd into the veins. But these things, you

(*l*) Schol. ad obs. 6. in Addit. ad Sect. 2. l. 1.

(*m*) Ibid. in Schol. ad obs. 12. n. 3.

(*n*) Epist. 3. n. 6.

(*o*) Obs. anat. circa duo Cadav. § 13.

say, are rare, and contrary to the general opinion: for what physician is there, who will not pronounce, that blood being extravasated, and confin'd, within the very substance of the brain, is mortal? Rare indeed! even let them be very rare; though perhaps not so rare as you before believ'd; for which reason it is proper for us to mention them, not to make us forget that what generally happens in medicine, is chiefly to be attended to by us; but lest we should be ignorant, that those things also may happen, which have in effect sometimes happen'd. Almost with the same design, I have elsewhere (*p*) refer'd to some dissections of apoplectic persons; even two of them I have set forth at large, the one from Valsalva, and the other my own observation, which, like that of the lethargic boy, copied from Forestus into the *Sepulchretum* (*q*), shew that the injury of the brain is sometimes on the same side with the paralysis of the body: although that the case is generally, not to say almost always, otherwise, is plain from the observations of Valsalva. And although he did by no means commit to writing, all his observations relating to the sanguineous apoplexy; yet those which we have describ'd above, remain; as those also do which I am about to describe.

17. An old man of seventy years of age fell down suddenly on the ground, having lost the power of moving and feeling, on the left side; and the right being considerably agitated by convulsive motions. His face was red. In less than twenty-four hours he died. His skull being open'd, coagulated blood was found between the right posterior lobe of the brain, and the dura mater; and a kind of concreted serum betwixt the sanguiferous vessels of the pia mater. which being cut through, a little serum flow'd out.

18. If you should happen to enquire why, out of the five apoplectic patients, whose histories are related, this, whose original disorder was not in the brain, but upon it, should be the only one, to whom violent convulsive motions happen'd, on the subjected side, (for in that first describ'd, violent convulsions are not said to have happen'd, and in the three others, they are not only not related, but in the woman they are expressly deny'd to have existed: and yet in all these, the injury, and that of the brain itself, was much greater) I confess it is not easy to account for, unless you can possibly suppose, that the coagulated blood, and serum, did not more compress the brain, than irritate the meninges, which they were contiguous to in this patient only; for as the right and left parts of the meninges do not decussate each other like the fibres of the brain, but descend strait down with the spinal marrow and the nerves, each into their proper side; so you may suppose, that the side of the body which was subjected to the irritated part of the meninges, was agitated with convulsive motions, in consequence of this irritation: or if the irritation could be propagated to the opposite side also, you may say, that the muscles of that side, being become paralytic, could not be excited into motion. But if you are pleas'd with this reasoning, then see how you can account for the irritation of the meninges in the first apoplectic patient; in whom there were at least some convulsive motions, though not so great. And attend also to some of the following histories, in which, though a cause was not wanting to irritate the meninges, yet no convulsive

(*p*) *Epist. Anat.* 13. n. 19. & 25.

(*q*) *I. I. S.* 3. obs. 34.

motions are taken notice of by Valsalva. But perhaps we shall endeavour to investigate these things more thoroughly in another place.

19. A man of fifty-eight years of age, of a good natural constitution, but much given to the use of tobacco, fell down suddenly, as he buckled his shoes. His speech was entirely lost; he had no motion. His face was pale, then grew somewhat yellow, as in a jaundice, and presently grew pale again: some little drops of saliva flow'd out of his mouth. In a quarter of an hour he died. His belly being open'd, every thing was found; and in the thorax also, although the inferior part of the lungs adher'd to the diaphragm and back, and both the lobes were very red with blood, especially the right, which was so turgid therewith, that on a slight laceration a great quantity burst forth. But in the cranium, a good quantity of coagulated blood was found, under the pia mater, on the anterior convexity of the brain, particularly on the right side. In the right also, and the left ventricle of the cerebrum, a little blood was seen, with a slight coagulum; but the plexus choroïdes, although it was found, might seem to have been affected with an inflammation.

20. But I shall now give you observations of blood being effus'd about the trunk of the medulla oblongata, and cerebellum. A servant-man, of two-and-twenty years of age, of a sprightly wit, endow'd with strong health, and undaunted by any labour, while he ran very fast after the chariot of his master, in the depth of winter, and when snow was falling on the ground, was thrown into an universal and profuse sweat; yet without changing his cloaths, he return'd in the evening to his usual business. But the day after, when he leap'd out of bed in the morning, having lost all sense, he fell down three times headlong. Being lifted up, he complain'd of a deep-seated pain in his head, but especially in the occiput; and was soon after affected with a fever, attended with a sense of lassitude and pain in his whole body. The day following he was purged with the pillula Galeni. On the third day he was let blood, but in vain; for the encreasing disorder grew into a kind of lethargy. On the fifth day he was scarified on the scapulæ, and blood was drawn away by cupping-glasses. On the eighth he was suddenly taken speechless, and lay immoveable for an hour, as if in an apoplexy. After that, the pain of the occiput was exasperated, and was extended even to the shoulders and spine, in a most violent manner. On the ninth day he lost blood in the other arm, from which the symptoms seem'd to remit; till at length the apoplectic paroxysm returning, his life was exchang'd for death.

The abdomen and thorax being examin'd, nothing was observ'd in the latter, but a small polypous concretion in the right auricle of the heart: but from the belly, the omentum had fallen down into the scrotum, and had form'd an epiplocele; and the whole internal substance of the testicle on that side, was chang'd into a membranous body. The head, the seat of the disease, was next enquir'd into; and where the medulla goes out from the cranium, some grumous blood was found, which had flow'd out from the lacerated trunk of the internal carotid artery. The ventricles of the brain contain'd a great quantity of saltish water: the right and left contain'd also a portion of condens'd blood. Finally, throughout the crura medullæ oblongatæ,
many

many little prominent bodies were seen, which, except that they were pellucid, resembled the little grains of millet seed.

21. These corpuscles recal to my mind “the little prominent papillæ, of the size of a small pin’s head,” which Brunnerus (r) saw in the back part of the right ventricle, into which the serous blood, in an apoplectic woman, had overflow’d; and “which had also been observ’d by him sometimes before, on the otherwise smooth and polish’d surfaces of the ventricles, when there was a disease of the brain: and who, without being a soothsayer, would not venture to affirm, that these were the little ducts which discharg’d this latex into the diseas’d brain.” Very pertinent also in this place, perhaps, is that observation made by Bonfilio on a horse, and related by Malpighi (s), on account of the similitude of the external foregoing cause: “This horse, after vehement motion and extreme heat, being expos’d to the winter’s cold, and a rushing wind, died; and in him the pleura was universally rough with vesicles, which were in great plenty, and turgid with ichor.” The other appearances describ’d in Valsalva’s history, except what relates to the epiplocele, which will be consider’d hereafter (t), very well account for the grievous pain of the head, and set forth its internal causes. As for instance, the great quantity of saltish water, together with a portion of condensed blood, found in the ventricles, but especially the extravasated blood which was concentered in such a place, that it would at once press upon the beginning of the medulla spinalis and the cerebellum, and by this means the cerebrum, and at the same time be contiguous to the meninges; so that the rationale of the lethargic and apoplectic disorders, of pain deep seated in the occiput, and extended from thence to the whole spine, is easily understood. And it is indeed much to be wonder’d at, that death was not sooner brought on, which has been the case with others, who had blood extravasated about these parts; as in a sailor, whose history you may read in the *Acta Cæsareæ Academiæ* (u); or in him, whose history is given immediately below: unless perhaps, in the servant-man in question, the carotid artery, being but little lacerated at first, did not emit much blood, though it was discharg’d freely at last.

22. A man of about sixty years of age, who drank freely of generous wine, though he was frequently us’d to fall down with a vertigo, was at length, on a certain day, just after dinner, when he seem’d to be very well, except that his cheeks were redder than usual, found lying dead on the ground, his upper limbs being extremely contracted, and the fœces alvi emitted. The cranium being sawed through, and the dura mater perforated anteriorly, a limpid water burst from betwixt this and the pia: and the pia mater, which was of a palish colour, contain’d a gelatinous concretion of serum in the interstices of its vessels. In the lateral ventricles, some of the glands of the plexus choroides were so turgid, as to equal the largest lentils in magnitude; and in the right were two grumous concretions of blood. In

(r) Vide Sepulchret. in Addit. ad sect. cit.
obf. 12. & in schol. ad obf. 5.

(s) Epist. de Struct. Gland.

(t) Epist. 43. n. 12.

(u) Tom. 2. obf. 109.

both sides of the cerebellum, the blood was so coagulated, as to resemble one solid polypous body; but the right side had the largest quantity of blood, even an ounce; and that portion of the cerebellum which lay about this kind of concretion, had a soft consistence, like rotten fruits.

23. That this sudden death was from a sanguineous apoplexy, not only the antecedent symptoms argue, but the appearances in the dissected head abundantly prove; yet that a convulsion was in some measure join'd with it, that great contraction of the upper limbs seems to shew. But that this apoplexy should happen, when the patient seem'd very well, doubtless testifies to us how much, according to the words of Celsus, those over whom this, or any other disease, from a rupture of an artery or vein, hangs threat'ning, *suspensa habere bona sua debent* (x), "ought to be suspicious of their present welfare." For by how much more languidly the heart and arteries contract themselves, by so much less will the danger of that rupture impend: on the contrary, the more strongly they act, and impel the blood, as in healthy persons, in so much greater danger of rupture are the debilitated parts of the vessels. And this speculation we have often seen confirm'd by observation; but never more evidently than in the sacred orator, whose sudden death, from a sanguineous apoplexy, will be mention'd in the next letter (y).

24. But that the describ'd apoplexy was very violent, the thing itself shews, and the discharge of the fæces, especially if we attend to the opinion of some physicians (z), did not obscurely testify: for they assert, that unless the disorder be very violent indeed, even when all the other parts of the body are paralytic, the sphincter ani will still be contracted. But the sphincter may sometimes seem not to be paralytic, although it be; because the intestines themselves being more inert in apoplectic patients, and the muscles of the abdomen not being strong enough in their impulse, the fæces, which are hard and few, are rather not expell'd by the contraction of those muscles, than retain'd by the action of the sphincter: yet I would not deny this, that the retention of those things injected into the intestines, often shews that the action of the sphincter is sufficiently preserv'd; and that by means of the communication of the same nerves, by which the motions of most of the viscera, but especially the heart and lungs, are supported. And that those nerves receive spirits, if not chiefly from the cerebellum, at least from that as well as from the cerebrum, seems an undeniable truth. But that the cerebellum is less frequently hurt in apoplexies, than the cerebrum, in part happens, from its being less than the cerebrum: and besides, though it should be a little injur'd, it is not ridiculous to suppose, that it may still do its office to those nerves, longer than the cerebrum, because it has a greater quantity of cortical substance, and seems to secrete a greater quantity of spirits in proportion thereto. And another not improbable reason may also be given for this, to wit, that the passages through which the cerebellum sends spirits to those nerves, are wider than the similar passages from the cerebrum; inasmuch as the cerebellum, when every thing was in its first tender state, began sooner to perform its office. For observations are not wanting to prove, that the cerebellum is much sooner perfected than the cerebrum; and what it then first

(x) De Medic. l. 2. c. 2.

(y) N. 17.

(z) Sennert. Med. Pract. l. 3. p. 2. f. 2. c. 11.

began, it goes on without intermission to perform, either in a waking or a sleeping state. But the more necessary those nerves are to the preservation of these motions, and to the support of their influence, the sooner all these vital powers, and of consequence, life itself, is lost: for the passages of the nerves, which were so open, and which us'd to convey such a quantity of spirits, being now precluded, that is, the cerebellum being injur'd, the power of the vital viscera must of consequence fail; and that so much the sooner, in proportion as the cerebellum is more violently and suddenly injur'd. And an injury in both these respects does actually happen, when blood, and that in considerable quantity, is suddenly extravasated upon the cerebellum, or rather in its substance. Nor should that kind of rotten softness, observ'd in the cerebellum, where the blood was surrounded with its substance, make you the less believe, that the laceration was sudden. For you will see, from other of our letters (a), that any little part of the cerebellum may gradually, and almost latently, be dispos'd to laceration; and when at length this suddenly happens, an injury of that kind may appear in the surrounding substance, which, though it be in effect recent, yet may easily be taken for an erosion of long standing.

25. I wish I could at any time determine, or rather divine, what it was Valsalva meant by what he formerly said to me, but never left in writing, that I know of; I mean, that when a certain porter had died of an apoplexy, he from the inspection of the naked body, had foretold, that the cause of the disorder would be found in the cerebellum; and had prov'd it from dissection. For that I had conjectur'd on which side of the cerebrum the disorder was seated, by only observing on which side the patient had fall'n, I have already observ'd (b); but how to determine, whether the mischief be in the cerebrum, or cerebellum, from the inspection of the body, I confess I do not clearly understand. I suspect, however, that it might be in some measure ascertain'd, from what I have already hinted; to wit, from respiration being suddenly suppress'd, the fœces of the intestines being emitted, and other circumstances of that kind. Harderus, indeed, in a patient who died suddenly of an apoplexy, concluded that a suffocation had happen'd from the following marks; "the face and lips were livid; bloody lines ran in the "course of the spine, and were dispers'd in various directions round about "it:" and agreeably to his conjecture, was found "grumous blood lying "about the cerebellum;" and this observation you have also in the Sepulchretum (c). But you, according to your usual and well-known sagacity, will enquire after less ambiguous matters. In the mean while farewell, and expect the conclusion of my observations on the sanguineous apoplexy in my next letter, having already sufficiently detain'd you in this.

(a) Epist. 3. n. 3.

(c) Vide in Addit. ad Sepulchret. l. 1. f. 22

(b) Advers. Anat. VI. animadv. 84. & Epist. obs. 5. cum Ichol. Anat. VII. n. 6. & XIII. n. 16.

LETTER the THIRD.

Which concludes the Observations on the Sanguineous Apoplexy.

1. **T**HE observations of Valsalva, on the sanguineous apoplexy, you have already in my last letter: and now, in pursuance of my promise, you will have mine.

2. A Venetian woman, aged fifty-five years, of a florid countenance, a large stature, and a full habit of body, was subject to violent pains of the cholic. This woman, besides, had, ever since a certain time of her delivery in child-birth, (for she was the mother of many children) grown so prominent in her belly, that she was thereby prevented from going about most of her domestic offices, with promptness and expedition. On account of these complaints, she said she could not bear to drink her wine diluted; she therefore drank it in a pure state, and that not sparingly. She was now slothful, dull, and inclin'd to sleep; and for some days past, this symptom also had attack'd her, either for that reason, or because her head was in pain, that she heard a very troublesome noise, of which she often complain'd. At length, about the third hour of the night, she said she was very ill; and mention'd particularly a pain in her right temple and right eye; and while she was sitting down on a chair, and asking for assistance, she was seiz'd with an apoplexy, in consequence of which she fell on her left side; but the motion of the right hand was not lost till an hour afterwards. At the same time, she threw up from her stomach, the wine which she had drunk that day, though the quantity of it had not been greater than usual: but her exertions in vomiting were very weak and feeble. I don't find she had any more assistance, than that of being put into bed, where she began to have a stertor; and though she certainly liv'd till the sixth hour of the night, yet in the morning she was found dead and cold; so that it was conjectur'd, she died about the ninth hour. The weather was now extremely cold, for it was before the middle of February 1708.

I dissected the body, in conjunction with that excellent anatomist Jo. Domenico Santorini, other learned friends being present. The abdomen was turgid, and rather abounded in fat, as did the omentum also. Almost the whole colon was in a manner like that of a dog: the cells were so few and so rare! and for a considerable tract, it was much more narrow than is natural. But before it degenerated into the rectum, it took a turn towards the navel, making larger folds than usual. The colon had a kind of smell, like that of an incipient gangrene, and the small intestines were of a more saturated blood colour than usual, here and there: and though the weather was so cold, as I have said, yet some heat still remain'd in the belly, notwithstanding

withstanding it was thirty hours after death, when it was open'd. Moreover, the spleen was distinguish'd by some little bloody drops on the surface; yet, in other respects, found: and in the gall-bladder, which was more contracted than usual, was contain'd a kind of bloody bile. But the liver was connected to the septum transversum by more connexions than common, and those were very irregular too; so that it seem'd to have been affected formerly with inflammation: on the surface which lay towards the diaphragm, it was here and there livid; and on the other, almost universally so: yet this livor did not penetrate deeply, and the viscus was, in other respects, whitish. The splenic artery had on the side of it, a kind of diverticulum, of a hemispherical figure, which was bony, and, to appearance, full of concreted blood. In the pericardium was a kind of bloody water, in a moderate quantity; in the heart, and the great vessels, were no polypous concretions: but blood only, and that neither harder nor softer than it should be. The valves of the aorta, at their lower circumference, were very hard, and near to ossification. The lungs were found to the touch, but in some places redder than usual. Before we open'd the head, we observ'd a large spot, of such a kind, about the mouth, that we doubted, whether it was from the wine that had been brought up, or whether blood also had come with it. The mouth itself, which certainly had not been observ'd in the first hours of the apoplexy, was distorted to the right side; nor was it the effect of a convulsion; for beside that the limbs, and the neck, were very flexible, I reduc'd the mouth to its proper place with my hand, the parts easily following without any force, and remaining where they were plac'd; so that the paralysis of the face seem'd also to have happen'd on the left side. Having cut through the cranium, which we thought was thicker than usual, we immediately saw blood to be extravasated beneath the dura mater, and to be shining through its substance. And that blood, as we perceiv'd by dissecting farther, cover'd the whole right hemisphere of the brain; for it even lay under the basis of the brain, and was form'd into one continued lamina every where. This lamina being remov'd, not only the sanguiferous vessels of the pia mater, both in the left and right hemisphere, were found to be more turgid than usual, here and there; but we also perceiv'd two or three foramina in that part, which cover'd the outer side of the right hemisphere, from which the blood, we have spoken of, issu'd out betwixt the two meninges. For these foramina led into a certain large and longitudinal cavity, form'd in the medullary substance of the same hemisphere, between the external side and the lateral ventricle, so as to be equal to two fingers breadth in width, and in length to six, or more. This cavity was contain'd within unequal, and almost eroded parieties; it was full of a grumous blood, and had a communication with the right ventricle towards its posterior part: by means of which communication, a small quantity of blood had been pour'd into that ventricle, and a small portion had even pass'd over into the left, by breaking through the posterior part of the septum lucidum: but the blood had form'd itself into a laminated concretion in each of the ventricles. It seem'd, however, that some other vessel also, must have been ruptur'd; since a lamina of blood was found below the transverse process of the dura mater, covering the whole cerebellum, though of a moderate thickness: for
you

you very well know, that in a natural state, there is no passage, from the cavity of the meninx, that invests the cerebrum, to that which invests the cerebellum. Moreover, in the spinal tube, as far as we could look into it from above, a quantity of blood lay extravasated about the spinal marrow. But some parts of the brain were of a slightly yellowish colour; the plexus choroides were flaccid, and in a manner destitute of blood; and the sinusses of the dura mater were empty.

3. The blood, to begin with that circumstance, is sometimes effus'd into the tube of the spine, and thence flows up to the cerebellum; or, at other times, descends from the cavity of the cranium to that of the spine; and even, sometimes, vessels may be ruptur'd in both cavities, and blood consequently extravasated in both. A remarkable example of the first case, was observ'd by Boerhaave (*a*), in a certain victualler, who was, for that reason, first made paralytic, and then apoplectic. But if a considerable quantity of blood, pour'd into the cavity of the vertebræ, does not flow out from thence; a mortal disease is brought on: "the many nerves of the spinal marrow, which give rise to the branches of the intercostal, being compress'd, and consequently the motion of the interior parts ceasing." And this du Verney (*b*) had long ago exceedingly well conjectur'd; who had observ'd another case of this kind; in which case, though join'd with a paraplegia, "the senses still remain," nor does a true apoplexy happen. But in the case I have now propos'd, as preceding symptoms had shewn that the brain was dispos'd to apoplexy, and as mischief enough of its own was found therein, there is no reason, why we should have recourse to blood, flowing up from the spine into the cranium, to account for it: but whether any part of the extravasated blood had pass'd from the cranium into the spine, or from the spine into the cranium, or whether it was extravasated in both at once, I leave entirely open to conjecture. If, therefore, we set aside the consideration of these things, as uncertain; and defer those which relate to other circumstances, and especially to the cholic pains, to be consider'd in their proper place (*c*); two things only in this history remain to be particularly consider'd. The one relates to the dogma confirm'd by Valisvalva; for in this woman also, though the paralysis happen'd on the left side, yet the injury in the brain was found to be on the right. The other relates to the diseas'd appearance of the brain itself: that we may enquire, from what cause, and in what manner, it was brought about. We will begin with the latter: and as to the former, when we shall have confirm'd it by more observations in this letter, it will then be not improper to say something upon that also.

There is an old doctrine, and perhaps none is older, observ'd by Varolius (*d*), and explain'd by Martianus (*e*), in his own way; who acknowledges, "acrid and eroding matter" to be a cause of apoplexies; which doctrine is expressly advanc'd by Hippocrates, or at least by the author of the book *De Glandulis* (*f*), saying, "that if the brain be really eroded, that

(*a*) *Prælect. ad Instat.* § 401.

(*b*) *Vide du Hamel R. Sc. Acad. Hist.* 1. 3.

S. 5. c. 2. n. 1.

(*c*) *Epist.* 33. n. 3.

(*d*) *De nervis Optic. Epist.* 2.

(*e*) *Annot. in Hippocr. de Gland. vers.* 103.

(*f*) n. 9. in edit. Marinell.

“ disorder is brought on, which is, among the Greeks, call’d apoplexy.” And the brain never seems to be more eroded, than when large and preternatural cavities are found within its substance; such as I have describ’d in this woman, full of blood, and with parietes so horribly lacerated, and bloody, that there is nothing which they more effectually resemble than deeply eroded ulcers of the external parts; therefore you see, that Vallalva, in the four first dissections, produc’d in the former epistle (g), has us’d the words erosion and corrosion, and the similitude of deep ulcers also. Do not however imagine, that these were real ulcers in the plexus choroides, or in the neighbouring sides of the lateral ventricles, so encreas’d by degrees, as to attain to the magnitude describ’d. For not to enquire here, whether those parts could long bear disorders of that kind, and yet life and the functions thereof continue; it is sufficient to observe one thing; that although we all of us dissect so many heads, and the heads of those who were dispos’d to a sanguineous apoplexy from the same cause; yet that we never meet with ulcers of that kind in the parts spoken of, which are begun, and still little; but only see them already form’d, and of a considerable size, in those whom a violent stroke of the disorder has carried off. Yet I do not deny, nay even readily acknowledge, that the beginning of such large lacerations is from eroding matter: but I say, that this beginning, whether it be from the erosion, or distraction of the coats of one or more of the small vessels, which carry blood through the brain, is wont to be so small and obscure, that although I have very frequently dissected, piece-meal, the brains of so many persons of all kinds; it never yet happen’d, that any thing of this nature fell under my notice. What then is the reason, you will say, why it so speedily brings on such devastation, and produces such prodigious cavities in the brain? I will tell you: but let me first give you another observation or two of the same kind.

4. A porter, a stout muscular man, in the fortieth year of his age, who was said never to have had any disease before, died, at the fourth hour of the night, of an apoplexy. His body, which was publicly given me for the anatomical purposes of the year 1734, I examin’d the more accurately, as, excepting the brain, and a few other parts, it was more proper for observation than almost all the others before demonstrated, and as at that time I had more leisure than usual. For which reasons I can safely affirm, that there was nothing preternatural in this body, except those things which I shall observe; and yet even all those were by no means preternatural. For the skin was universally brown, but this was natural; as the face, unless in some parts where it was livid, was much less brown than the other parts of the body, and even, when compar’d with these, was fair. The intestine colon was very much contracted, except at each extremity, where it was turgid with flatus. When the colon was first mov’d, although we open’d the belly the day after death, and that in the month of February, yet the intestines which lay upon the loins, still smok’d. But I will tell you what was evidently preternatural. The extremity of the ileum itself was swell’d on its internal surface, though not universally; and was of a red colour, degenerating to lividness. The

liver was hard, and being externally, in colour, like a reddish marble, variegated with white, was internally like a liver that has been boil'd, and in both places shew'd, here and there, the small lobules of which it is compos'd. It had besides, a foramen on its convex surface, where its substance seem'd to have been originally deficient. This foramen was at the distance of an inch from the lower edge, and open'd into the sinus, which is hollow'd out on the posterior surface of the liver, for the gall-bladder to lie in; so that the extreme part of the fund of the cyst appear'd through the foramen, as we look'd from that surface. Yet the gall bladder was not shorter than common; but being first contracted in its middle, and then again dilated, its fundus was bent upwards and forwards, and thus became visible through the foramen, as describ'd. This unusual kind of vesicle contain'd a deeply green, and almost blackish, bile, which however stain'd paper of a dirty yellow; and in its fund were black calculi, or concretions, of different figures; but all of them so irregular, that you might compare them to the fragments into which any hard body should be accidentally shiver'd by being broken. One of these calculi being immediately applied to the flame, did not burn, but only crackl'd: the others being thrown into water, lay scarcely a moment on the surface, before they all fell to the bottom. They were all small; but one, a little larger than these, lay hid within the cystic duct. This, however, was still so small, that it could not hinder the passage of the bile into the intestines: for that the bile had access to the intestines, the scæces, which were ting'd with a greenish colour, sufficiently prov'd; although the little eminence, which points out the entrance of the biliary duct into the duodenum, nor the frænulum, which is wont to be attach'd to it, were conspicuous. The kidneys seem'd small for the bulk of the body.

Some of the valves that are plac'd at the orifices of the heart, which receive the venous blood, discover'd, on those surfaces that are turn'd towards one another, little glands as it were, which protuberated to the edge of the valve, and were made up internally of a dense, firm, and compact substance.

But from the abdomen and thorax, I come at length, as you expect, to the brain. And here the right hemisphere discover'd an extravasation of blood, begun under the pia mater, at that part where it is contiguous to the left hemisphere anteriorly: the vessels were also more turgid than in the left. Yet in this left hemisphere, a great cavern lay hid, form'd internally almost in the middle of its substance, and hollow'd out from the medullary part longitudinally; which cavern was full of the most black and half-concreted blood; and for this reason, the vessels of that side were less turgid than in the other. The parietes of this cavity were not only here and there lacerated, but also open'd, through the body of the corpus striatum, into the left ventricle, by a foramen big enough to admit the point of a finger; and by this passage, much bloody serum seem'd to have escap'd, which had fill'd both the left and the right ventricle, the septum lucidum being broken through. However, the fornix, and the plexus choroides, were found; but the vessels of the cerebellum were likewise very turgid on the left side.

5. If what we were inform'd of was true, (and the examination of the viscera is not very repugnant thereto) that this man had never been afflicted with any disease, after so long a tranquillity, how great, and how long continued.

nued a storm impended, as is generally the case, you will easily conjecture from the state of the liver. Yet this threatening was doubtless averted by that very acute disease, which suddenly depriv'd the man of his life. But can we possibly suppose, that this acute disease was brought on by those calculi found in the gall-bladder? Certainly there have not been wanting those who would pronounce the calculi of that bladder to be the causes of apoplexies (*b*); and they have produc'd the observations made by themselves and others, who have met with them in the dissection of apoplectic patients: and we can moreover encrease the number of these observations, by the addition of our own (*i*). On the contrary, Weitbrecht (*k*), when in the same disease he had found ten angular calculi in that cyst, and among those two pretty large ones, says, "Can calculi of that kind be consider'd as the causes of an apoplexy? To me there seems to be so great a chasm in this reasoning, that I dare not undertake to fill it up." And certainly, in most cases, it would require a long and tedious explication, drawn through a manifold series of causes and effects, to deduce it from this origin. For I should think, that those cases are to be excepted, to which Frederic Hoffman refer'd (*l*), to wit, when the patient was liable "to pains from a calculus in the bladder, and gall-bladder also;" so that spasmodic contractions being brought on in the belly, and the neighb'ring vessels being thereby constrict'd, an unusual quantity of blood was retain'd in the upper parts. But as the porter in question is said never to have been afflicted with any of these disorders, we will refer the consideration of his bilious calculi, and those of others, to some other occasion (*m*); inasmuch as these, for the most part, create only a mild, and a sluggish disorder: and we will now confine ourselves to the most violent and dangerous, of which the following is the third example.

6. A woman, of forty years of age, and much given to drinking, was seiz'd with an apoplexy. From this she became paralytic in both sides, and was brought into the hospital at Padua, and there she soon died. In her body, by reason of the unreasonable heat of the weather, for it was not yet the middle of March 1740, I scarcely examin'd any other part, in the hospital, but the head. The skull seem'd narrow in its cavity, in proportion to the length. There was polypous blood in the falciform sinus. The vessels of the pia mater were so distended with blood, that the larger ones were almost black; and the smallest made a very beautiful appearance, as if injected with red wax. The cerebrum and cerebellum were so soft, that the pia mater was easily drawn away from them by the hand. While I cut here and there into the substance of the brain, not only bloody points and filaments appear'd more frequently than usual up and down, but in the medullary substance of each of the hemispheres a cavity was found. One of these cavities was small, and being situated at the external side of the thalamus of the right optic nerve, was of such a size and shape, that it would just admit a very small oval prune. It was almost clos'd, unless that it was stuff'd up, in some measure, with a brown gluten, or half-dried mucus. But the other cavity was

(b) Vide Eph. N. C. cent. 4. obs. 169.

(i) Epist. IV. n. 13. & V. n. 6, 19.

(k) Commerc. Litter. a. 1734. hebdom. 9. n. 2.

(l) Med. Rat. t. 4. p. 2. f. 1. c. 7. Thef. Pathol. § 10.

(m) Epist. 37. n. 37.

in every dimension large, more especially in length; for it was produc'd to the whole extent of the left ventricle, lying upon its external side, and was full of blood, such as I have already describ'd in the porter(*n*); a small part of which blood had penetrated into that ventricle, and from thence into the third ventricle, two foramina having been made, reaching from that cavity through to the left ventricle, the one at the external side of this ventricle forwards, and the other backwards. The right ventricle, whose plexus choroideus was somewhat pale, did not contain much water, and that was entirely free from blood. When I inverted the cerebrum, the trunk of that artery into which the vertebals are conjoin'd, exhibited a small white elliptical spot; but upon examination, I found it was not of that kind, which is generally us'd to be the beginning of an ossification, as I had thought; but somewhat soft in the parietes of the artery itself, and rather in the interior coat; yet there was no prominence either internally or externally. Last of all, looking downward from above, I perceiv'd the pituitary gland to be very low in the sella equina. And whatever I have here written, I demonstrated to many pupils, who were present.

7. I was much chagrin'd, (which however must often be borne with, in country-people, among the lower class, and in foreigners) that neither in the case of the porter, nor of this woman, it could be certainly known, whether, on the attack of the apoplexy, they became paralytic in both sides equally, or in one only first, and in which; for both of them should seem to have been paralytic in the right. But in regard to the woman, I bore it more hardly still, that nobody could even tell, whether she had been seiz'd with an apoplexy at any other time. To me it seem'd so, and that thence a paralysis, or debility, remain'd in the limbs on the left side, when I consider'd that lesser cavity, which I have describ'd to you, and compar'd it with those observations pointed out in the former letter (*o*); but especially when I compar'd it with the observations of Brunnerus, who even then found some moisture in the cells of that kind. But what puzzled every body, was to account for the manner, in which those great caverns, describ'd in the three foregoing dissections, and overflowing with blood (*), were so suddenly form'd; and this, as I promis'd above, I will endeavour to make some conjecture upon.

8. Nothing is more natural, when we see these caverns in the brain, and blood semi-concreted therein, or effus'd in great quantity into the neighbour'ing parts, than to call to mind the rupture of aneurisms in the belly or thorax, and even to imagine, that something similar to this might sometimes happen within the cavity of the cranium; especially as those symptoms often precede the most dangerous apoplexies, which would of themselves lead us to imagine such a circumstance. Thus two aneurisms preceded that apoplexy, which in twelve hours carried off my worthy and learned colleague Bernardin Ramazzini. These aneurisms were no bigger than beans; and what is very extraordinary, each of them was seated in the same place, that is, on the back of each hand, at the point of the angle, between the thumb and the fore-finger. I very well remember, that the good old man was us'd often to shew me these

(*n*) Epist. 37. n. 4.
(*o*) n. 16.

(*) Cavernas hujusmodi vid. etiam epist. 60.
n. 2 & 6. in cerebro & cerebello.

aneurisms, which came upon him, in the last years of his life, and at the same time to mention what he had suffer'd before; both the violent palpitation of his heart, and the no less violent hemicrania which succeeded it: and in this disorder it was, he said, that Philip Maffieri, doubtless a skilful surgeon, as his writings shew, found out a most wonderful circumstance in him, when he was very old, to wit, a separation of the futures of the cranium: many examples of which kind, I know, are related by Bonetus (*p*), by Etmuller (*q*), by Stalpart (*r*), by Helwich (*s*), by Platner (*t*), and by the illustrious Haller (*u*); but how many in old men of seventy, such as Ramazzini then was, I know not. Nor am I ignorant, how difficult it is to disunite the futures in old men by all the power of art; and this is moreover confirm'd by Bergenius (*x*). Last of all, a blindness also, first of one eye, and then of the other, which came on after the palpitation and hemicrania had left him, and lasted to the end of life, preceded the apoplexy of Ramazzini. From attending to all these circumstances, (for he us'd, by reason of the benevolent opinion he entertain'd of me, to communicate all his indispositions to me) it seem'd not improbable, that an internal hemicrania had been brought on by the same causes, which had before excited the palpitation; and that some of the arteries within the cranium, and perhaps in the plexus choroides, the blood being obstructed by the painful contractions, were seiz'd with the same disorder, that we saw externally in each hand; which increasing by degrees, and pressing upon the thalami of the optic nerves, brought on blindness; till at length the coats of those small arteries being broken through, and blood effus'd into the ventricles, a fatal apoplexy was the consequence.

9. As the body of this good old man was not open'd after death, I do not know whether I conjecture right or not. This, however, I know, that should any one choose to account for those caverns, which I have describ'd, within the substance of the brain, by supposing them to arise from aneurisms, or varices; he must take care, for reasons above mentioned (*y*), not to suppose that these caverns were the real cavities of aneurisms, or varices, gradually expanded to that bigness. It is much better, and more agreeable to that slenderness of coat, which is peculiar to all the vessels of the brain, to imagine, that when they have come to a small dilatation, which is scarcely, and perhaps not at all, perceivable to the eye, whether gradually or soon, they are suddenly ruptur'd; and that according to the various diameters of the vessels, and the largeness of the rupture, and the quantity of the blood, and the impetus with which it is continually urg'd from behind, and even the laxity of the brain, a little sooner or later, larger or lesser caverns are form'd: and that these, according to the larger or smaller lacerations of the parietes, or according to the various seat of the laceration, are sometimes shut up; but sometimes open into the ventricles, or externally through the surface of the brain; and sometimes even both ways at once. For the substance of the brain, being very soft, yields, and admits the impell'd blood;

(p) Sepulchr. l. 1. f. 1. obs. 92. & schol.
& append.

(q) Prax. l. 2. f. 2. c. 3. art. 7.

(r) Cent. 1. obs. 1. & schol.

(t) Eph. N. C. cent. 10. obs. 31.

(u) Disput. de Off. Epiph. § 37.

(x) Ad Boerhaav. Praelect. in Instit. § 304.

(y) Method. cran. ossa dissolvendi.

(z) N. 3.

so that an apoplexy and a cavern are form'd at the same time : and this cavern, as long as the force of the heart and arteries does not languish, is still farther encreas'd, and the apoplexy is encreas'd with it, unless the physician, or rather some very rare accident, to assist the physician, intervene, and prevent the progress of it (*z*). Nay, the very quantity and weight of blood, extravasated into the cavern, or from thence into the ventricle, may, even sometimes after death, break through some small and tender part, suppose the septum lucidum for instance ; especially when the head of the body is shaken after death, or inclin'd upon the sound side of the cerebrum. But as to what I have said, in regard to the production of a cavern, by blood effus'd from a vessel, ruptur'd by distension ; you will easily suppose the same to take place also, if blood be pour'd forth from a vessel that is eroded. For the vessels of the brain, like those of other parts, are liable to more than one kind of disorder ; and that is evident in the vessels which are somewhat larger than the others, as I shall show presently (*a*) : and, indeed, a peculiar disorder, of this kind, I have already describ'd, in the artery of the woman (*b*), whose dissection I just now propos'd.

10. It does not escape me that Brunnerus, in his observation of that kind, which I have so often commended (*c*), where he seems to understand a cavern by the name of "large hiatus," or "fissure," also adds beneath, "that he had seen elsewhere, little arteries, affected with disorder, or aneurism, which seem'd to have pour'd out this very large quantity of blood." But does not point out their situation, and the diameter of the aneurism. Wepfer, whose observation you also have in the Sepulchretum (*d*), is more clear in this matter ; he describes a "cavity, or antrum ;" and although he uses the example of "an aneurism," yet I do not see, that he understands the thing otherwise than I do ; nor does he call it a true aneurism, but properly enough a "spurious" one (*e*) ; so that if we are to depend, rather upon the judgment of others, than our own, in explications of this kind, I had rather you would follow the decision of so great a man, than mine. But now let us go on to other histories.

11. Anthony Tita, the same who publish'd here, in the year 1713, the "Catalogus Plantarum Horti Mauroceni," was carried off among the first of those who died suddenly at Padua, in the beginning of May, 1729. For at that time, numbers were swept away, to the great consternation of every body ; and that without lying ill more than a few hours, though they generally died immediately. The weather was then considerably hot, and had begun to be so suddenly, after long-continued cold, and damp seasons : for the autumn, the winter, and even the spring, had been rainy till that time. Tita was seventy-three years of age, yet even then robust, and brawny, of a square well-set body, and somewhat fat : he was us'd to be much expos'd to the sun, and to drink of undiluted wines without drunkenness ; he had been troubled for some years past with inflammations of his eyes ; and had lately complain'd to my celebrated colleague, Anthony Vallisneri, of a fullness in his head. On the fourth of May, when the sun was unusually hot,

(*z*) Vid. Epist. 2. n. 16.

(*a*) n. 22.

(*b*) n. 6.

(*c*) 12 in Addit. ad S. 2. l. 1. Sepulchr.

(*d*) 18. S. cit.

(*e*) Ibid. in Schol.

having spent the whole day in the open air, and supp'd in the evening as usual; he suddenly cried out, while at table, that he was seiz'd with a violent disease; and as he spoke, lost the use of his left limbs, and his tongue also; at least so far, that most of his words could scarcely be understood. Being immediately call'd, and very near at hand, I ran to him instantly: and found him just as I tell you: his senses at the same time were perfect; the colour of his face, respiration, and the heat of his body, were natural; his pulse, in like manner, was full and strong; and he complain'd of no pain or disorder in his head, but seem'd to himself to be sleepy. Attending to this, and still more to what I related above, I sent one person to call a priest, and another to call a surgeon, fearing he might have another, and a more violent attack. I order'd a proper quantity of blood to be taken from the healthy arm immediately, a pretty smart glyster to be prepar'd, and then oil of amber to be brought, and frequently applied to his nostrils; but the spirit of salt ammoniac I expressly forbid, lest it should immoderately excite the circulation of the blood, from which I foretold that a fatal event might happen: the rest, I left to his own physicians, who, I knew, were coming, and return'd home. One of these thought proper to give an emetic; which I should not have thought improper before, if I had only consider'd the circumstances that he did. But soon after the agitation of vomiting, about the fifth hour of the night, an attack came on, so much more violent than the former I have describ'd, that his speech was entirely lost; and a stertor began, join'd with violent, and, as I suppose, convulsive, motions and strugglings of body. On the morning following, therefore, he died.

On the sixth of May, his head was dissected in my presence, by the governor's order. The dura mater adher'd so much more closely than usual to the skull, that great force was requir'd to pull it away. It was also blackish from the fullness of the vessels, but from the smaller vessels only; for the falciform sinus was empty. In the pia mater, the vessels were distended with blood; but the right ventricle much more. For it contain'd so much black and concreted blood, as would fill the shell of a hen's egg, and that in its posterior part; and the part nearest to that, where it descends forwards with the hippocampus. In the three other ventricles also, there was blood, though in much less quantity, and so fluid, that I should rather believe it was only a bloody serum, press'd out from the coagulated blood, and fall'n down upon those ventricles. For the brain was sound, and the substance of the hemispheres entire; so that it did not appear, from whence such a quantity of serum could have been discharg'd. However, towards the posterior part of each lateral ventricle, but especially of the right, the plexus choroides had vesicles full of water, of such a magnitude, that I do not remember to have seen bigger; for they were of the size of large grapes; but the situation, in which we found the greatest quantity of blood, and that coagulated too, made us think it probable, that this had been effus'd from the ruptur'd vessels of the left plexus, and the neighbourhood thereof.

12. To begin with these vesicles: you will read in the *Sepulchretum* (f) that Wepfer not only saw some pretty large bodies of this kind in those

plexusses, but even one that was solid: yet did not from thence, or at least not immediately from thence, deduce the cause of the apoplexy (g). You will also read, that Warthon (b), in like manner, though he had frequently found the glands of the same plexusses, tumid in apoplectic persons, and the ventricles of the brain fill'd with blood; nevertheless, attributed no other effect to these glandules, but the giving occasion to such an effusion of blood, by reason of the circulation through their vessels being obstructed; and you will perhaps think, that this is confirm'd by the observation of Drelincourt (i), who, in an apoplectic woman, found those plexusses fill'd with "the most tumid watry vesicles, united and conglobated together," and ruptur'd in the middle, so as to have pour'd out much blood. But whether these, or other things also, as I suppose, were the causes of distension, and rupture, in my friend Tita; you will certainly easily understand by this relation, that from the very time in which rupture and extravasation have been begun, we ought to take the utmost care, not to agitate and impel the blood, by troublesome concussions. Nor can I believe, that Brunnerus (k), when he had happily freed an apoplectic woman from the first paroxysm by bleeding, and "whatever could make revulsion from the head," was pleas'd, that in the second, "he had applied burning sulphur to the nostrils;" or that by pouring liquor into the mouth, "he had twice or thrice excited a cough;" or at least, not when after her death, which soon follow'd, he found most of the ventricles of the brain fill'd with blood, and the whole cerebrum itself cleft asunder internally from the eruption of it. So in that Danish ambassador, of whom Weitbrecht (l) has given us an observation; what sneezings and vomitings, if they had been brought about, as was attempted, were likely to have effected, you will see from a dissection which is, in the principal things, very similar to that of Tita; as you will learn below (m). But I, from the foregoing symptoms, fearing that death would happen so much the sooner from the agitation of the blood, not only in the case of Ramazzini, spoken of above, prevented a physician, a man of some eminence, who was inclin'd to the sect of empirics, from pouring into his mouth an emetic medicine, which he could not have swallow'd; but would also have prevented the other, who administer'd one to Tita, had I been present. But it was necessary, you will say, that what this man had taken into his stomach at supper, should be discharg'd by vomiting; left, being taken into the circulation, the quantity and impetus of the blood should be increas'd thereby. This were certainly to be wish'd; provided it could be done without straining or violence. Otherwise, there is so much the less reason for attempting it, as that future increase of the blood might be render'd of no effect, by previous evacuations of it; but the present danger, of increasing the rupture of the vessels, and the effusion of the blood, from violent strainings and agitations of the body, could be by no means prevented. I knew a gentleman, nor was he the only one (n), who being very full of

(g) Ibid. in Schol.

(b) Ibid. obs. 10. § 2 cum Schol.

(i) Ibid. obs. 12.

(k) Obs. exp. cit. 12. in Addit. ad eandem

Sect.

(l) Commenc. Litterar. A. 1734. Hebd. 9.

n. 2.

(m) n. 8.

(n) Vide etiam infra, n. 22.

blood, was snatch'd away by the most violent apoplexy, while he was straining to go to stool. The same thing also Valsalva saw, and confirm'd by dissection, as I have said in a former work (*o*). And the observation of Adolphus (*p*) is of that kind; for he tells us of a fatal apoplexy arising from "a very strong and unseasonable straining" of a woman in labour; by which the plexus choroides was ruptur'd, and the brain violently compress'd by extravasated blood. And how much more blood is urg'd into the vessels of the brain, by such strainings; and at the same time how much less can return from thence, the celebrated Van Swieten has shewn (*q*). And examples are by no means wanting of those (*r*) who, when the vessels of their brain have been distended, "have had them ruptur'd by the slightest commotion, as "from a fall, a box on the ear, an inclination of the head, and the like." And if there was a time in which "many died suddenly while they sneez'd (*s*)," I should believe, that this could hardly happen from any other cause. And if vessels, which are as yet sound, may be ruptur'd by concussions; how natural is it to conclude, that ruptures, already made, must be still farther encreas'd? And so far it is from being reasonable to give warm medicines, or liquors of any kind that stir up the circulation, though so frequently thrown into the stomachs of apoplectic persons by some physicians, without any distinction of serous or sanguineous apoplexies; that nothing of this kind ought even to be applied to the nostrils. And I am amaz'd that a certain great physician, when living, and who, in other respects, deservedly taught the same doctrines as his cotemporaries, was so far from avoiding this practice, among others which, I think, ought to be avoided here; that in this hæmorrhage of the brain, of which we now treat, he particularly recommended spirit of salt ammoniac, or its volatile salt, applied to the internal nostrils by a feather, or even blown in by a quill.

13. It will not be improper to subjoin something concerning the season, in which Tita, and so many others, died of a rupture of the sanguiferous vessels. There is certainly great danger of this disorder, either in the depth of winter, or the height of summer; the external vessels being strongly contracted by the one, and the blood greatly expanded by the other: and when the external vessels are contracted by cold, not only a greater quantity is thrown into the internal vessels, but the fluids are also encreas'd by the matter of insensible perspiration being obstructed; and when the blood is expanded by heat, the same thing happens, as if its quantity were encreas'd. But as it is slowly, and by degrees, that we, for the most part, come to the severest cold, or the most extreme heat, so the vessels are gradually contracted, and expanded, to accommodate themselves thereto: for which reason, there is much less danger than when either of them happens to come on suddenly, as was the case at that time. For the sudden heat of the weather caus'd an unusual expansion of the blood; when at the same time, by reason of the foregoing cold, the vessels were neither dilated, nor the blood diminish'd in its quantity by insensible perspiration. Besides, the fibres of the vessels were render'd so weak

(*o*) *Epiſt. Anat.* 13. n. 19.

(*p*) *Act. N. C.* t. 1. obſ. 241.

(*q*) *Comment. in Boerh. Aph.* § 1010. 3 Y. *Prol.* 4. n. 3.

(*r*) *Vid. Schoff. ad obſ. 1. Sect. cit. Sepulchr.*

(*s*) *Vid. apud Stradam Proluſ. Acad.* 1. 3.

and relax'd by the long-continu'd rains, that they were on this account the more liable to rupture. So that you easily see, from all these circumstances, what things are to be particularly avoided at such seasons, by those persons who are under a general danger of these disorders. But those who are peculiarly liable to these disorders in the brain, ought also to beware of other things; and, among the rest, they should avoid intense thinking, especially in a recumbent posture, when the blood has a very easy ascent to the head, and descends with difficulty. Thus, I knew a learned man at Bologna, who, if at any time he fix'd his mind upon abstruse speculations, before he rose in a morning, as men of letters generally do, had always some drops of blood falling from his nose when he got up. And I would have you beware of the arguments of those who assert, "that the force of gravity, in proportion to the other powers which generate motion in the blood, is nothing." Beware, I say, giving so much heed to them, as to forget the utility which prudent physicians experience from an erect situation, in preventing too great a quantity of blood being carried to the head, either in certain diseases themselves, or in the mere dispositions to them. And at the same time, do not forget what is so evident to every body, that upon stooping the head, the face very soon grows red and hot: but enough on this subject at present.

14. An old man, who had been us'd for a long time past, by reason of a large ulcer in one of his legs, to sit begging at the gate of St. Anthony's church, being accusom'd to eat very plentifully, as I hear most of these people do, and using very little or no exercise for the reason above mention'd, was seiz'd with an apoplexy, whereby his internal senses, the use of his tongue and left side, were entirely taken away; so that he died within three or four days.

As the body, by reason of its putrid smell, and the bad colour of the intestines, which had a mixture of red and brown, was unfit for the anatomical demonstrations that I gave at the hospital, in the year 1741, I order'd it to be buried, preserving only the head. When the head was to be open'd, in the presence of a number of learned men, and young students, to find out the cause of the apoplexy, I by chance observ'd a slight contusion on the anterior borders of the temporal muscle, on the left side. Having enquir'd into it, I found that this contusion was the consequence of his falling from his seat, when the apoplexy had seiz'd him: upon which I did not hesitate immediately to foretel, that if the cause of this apoplexy should fall under the notice of the senses, and had not its origin from serum, it would, according to a certain conjecture of mine, (hinted (1) in the last letter) be found in the opposite, that is, in the right side of the cranium. And in this conjecture I was much more confirm'd, when it was also added, that the man had been paralytic on his left side, as I have already said; which by chance till then I had not heard. At length the skull being cut through, and a little water having flow'd out in the operation, all the parts beneath immediately appear'd more full of blood than they generally do. Having drawn aside the dura mater, in whose upper sinus a little polypous concretion was found; not only the vessels of the pia mater were more tumid with blood on

(1) N. 25.

the right than on the left side, but also on the right hemisphere of the brain; and on that only, appear'd some half-concreted blood, which seem'd to have come from some of those tumid vessels, and to have flow'd downwards. For under the basis of the anterior part of the posterior lobe of the right hemisphere, a little more of the same kind of blood appear'd, in like manner, betwixt the two meninges. Nor was there any other extravasation of blood within the cranium, but that which I have mention'd; and this was about the quantity of two spoonfuls. These things being demonstrated thus to all who were present, other things also were shewn, which, though they seem'd of less consequence, yet were relative to the present enquiry. The summary of them is this. A kind of gelatinous humour was seen to shine through the substance of the pia mater. The vessels were not only distended in the medullary part of the brain, as a number of points, starting with blood here and there, testify'd, but also the vessels which creep through the surface of the lateral ventricles. These ventricles did not contain much water; yet at the posterior part of the choroid plexus's were a great number of vesicles, though not of the largest kind; but those in the right were somewhat less than in the left; and less water also was contain'd in the former than the latter. The plexus's, however, were so far from having lost their colour, that they were even more fill'd with blood than usual. Last of all, at the anterior basis of the pineal gland, was found something yellowish, but not hard.

15. How much plentiful eating, without exercise, tends to accumulate blood, and render it impure, especially where deprav'd and acrimonious particles are absorb'd from any large ulcer, and taken into the circulation, like other things which I pass over as self-evident, needs no explanation. But what mischief may result even from a little blood being suddenly extravasated within the skull, and the manner in which this mischief is brought about, will be shewn on another occasion (*u*): for the other circumstances observ'd in this brain, are often found even where there is no apoplexy. And as to the blood, which was extravasated on the right side, bringing on a paralysis in the left; this agrees with almost all the observations of Valsalva, and with mine. And you will have observations of this kind relating to other species of apoplexies, at another time (*x*). But now you have in this (*y*) and the former (*z*) letter, out of various observations relating to the sanguineous apoplexy, those at least which Valsalva and I committed to writing; and would have had many more, if in giving such observations, and setting them forth with all their circumstances, I had sufficiently accustom'd myself to depend upon my memory alone, though some space of time had pass'd between. In the place of these, therefore, which for that reason I omit, I will here finish an observation common to Valsalva and me; for I observ'd the disease, but he dissected the head with me, and publish'd (*a*) such a part of the history only, as was sufficient for his purpose at that time. The following is the memorandum I made of it at the time.

(*v*) Epist. 4. n. 32, & seq.

(*x*) Epist. 11.

(*y*) Epist. 2. n. 9, 11, 13, 15, 17.

(*z*) N. 2, 11, 14.

(*a*) Tract. de Aure, c. 2. n. 15. in fin.

16. A man, aged forty years, being liable to a vertigo, from the intemperate use of wine, was seiz'd with an apoplexy, about the beginning of February, 1703. Being immediately brought into the hospital of St. Mary de Vita, when I was there, as I us'd to be every morning, he appear'd to be already somewhat reliev'd of himself. The physicians order'd his legs and his feet to be vehemently rubb'd, spirit of salt ammoniac to be applied to his nostrils, and even some drops of it in a proper vehicle to be pour'd into his mouth, and blood to be taken away from his arm. The blood was taken from the left arm, on which side he was most affected with a paralysis. While these things were doing, the man was twice seiz'd with a tremor, began to move his cheeks and his mouth, and to be seemingly more and more affected with palsy; and slight convulsive motions presently appearing on the right side, a more violent apoplectic paroxysm return'd on the same day, which carried him off about the second hour of the night.

While the head was fever'd from the body, much blood flow'd out, part of which came from the mouth. Then Valsalva said to me, this apoplexy, unless my observations fail me, was brought on by blood injuring the right side of the brain. In mean while, as we took off the common involucra of the cranium, we saw even the smallest blood-vessels of the pericranium to be manifest and distinct: yet we presently saw the small vessels of the meninges still more distended, especially through the left side of the pia mater; where besides, on the top of the hemisphere, there was some extravasated blood, which resembled the blackness of a contusion. But when we came to the lateral ventricles, I admir'd the truth of Valsalva's prediction. For though there was in the left ventricle some portion of extravasated blood, yet it was what seem'd to have flow'd there from the right. For in this last-mention'd ventricle, there was not only a greater quantity of black and concremented blood, but also a great hiatus from whence it had proceeded; as if any one, with a large blunt knife, had penetrated through the external side of the corpus striatum and thalamus nervi optici, and had turn'd both of these parts over the fornix and the third ventricle. Other things which relate to the passage of the blood that was discharg'd from the mouth, you will find sufficiently explain'd by Valsalva (*b*).

17. Why the physicians chose to take blood from the arm which was diseas'd, whether for a reason similar to that which is contain'd in the Sepulchretum (*c*), and Baglivi follow'd, or for other reasons, is not easy to determine. Nor were the observations of Valsalva yet made, nor the doctrines drawn therefrom; to which weight is added by the precept of Aretæus (*d*). In an apoplectic person, says he, "we must consider the parts that are affected with palsy; whether the resolution is on the right, or on the left side: for we must take blood from the healthy parts (as we commonly say), since by this means it is easily drawn off, and a derivation also is made from the injur'd parts;" that is, from the injur'd hemisphere of the brain, inasmuch as he taught that the diseas'd side of the brain would answer to the sound side of the body: and this I have already shewn by a quotation pro-

(*b*) Tract. de Aure, c. 2. n. 14. in fin.

(*d*) De Morb. Acut. Cur. l. 1. c. 4.

(*c*) In Addit. ad cit. 2. sect. obs. 13.

duc'd from him, in a former work (*e*). But concerning the precept and doctrine, which were just now set forth in the words of Aretæus, the celebrated Oederus (*f*) thus determines: that he thinks the precept truly commendable, and approves the first reason, of the blood flowing more easily from the veins of the sound arm, than from the veins of that which is diseas'd; and even farther illustrates and confirms it. But the other reason, though supported by the observations of Valsalva, which he acknowledges the truth of, he rejects for this reason only, because it depends upon the common doctrine of derivation; which he very learnedly and nervously, as far as he could, undertook to disprove. Wherefore he denied, that the doctrine was at all confirm'd by the observation of Paulus Salanus, and those of other excellent men; as it had seem'd to Valsalva (*g*) and me. But he compromises his dissent from me with so much humanity, that I should think myself very uncivil, if I were not to submit these few things which I shall say, to his judgment and decision. Valsalva and I were afraid to attribute that which Salanus saw, to chance; since we observ'd, that it agreed with observations which Valsalva pointed out, as well as with others which I said were omitted by me. And it agreed with reason also; for the veins of the right arm communicate more with the right internal jugular, than the left; that is, by their depletion, they seem more to favour the depletion of that jugular, and consequently of the veins which flow from the right side of the cerebrum into the right sinusses: and that Salanus let blood from the arm, we thought could be easily understood; because in the discourse made by Valsalva and me on the hemiplexia, no mention is made of venæsection in any other part. In the mean while, I don't doubt but this candid gentleman will give me leave, in conjunction with Segnerus, that very grave professor of medicine and mathematics, and his president (*h*), "to adhere in one general opinion, to those things, which faithful authors have advanc'd, if not with full certainty, at least with great probability, concerning the choice of veins to be open'd in particular disorders; since no danger can possibly arise from it."

But to return to the dissection: you will ask me, perhaps, whether others, beside us, happen'd upon the same thing, and found the internal cause of the hemiplexia, not on the same side with the disease, but on the opposite? I have already pointed out some who saw it before Valsalva, but neglected it as accidental, as Wepfer (*i*) and Baglivi (*k*). However, after the observation of Valsalva was publish'd, I do not doubt but many saw the same thing: and that some did, I know (*l*). For the same year that I confirm'd the doctrine of Valsalva, in the Venetian woman, spoken of in the beginning of this letter (*m*), I was inform'd, when I came by accident to Padua, that the same thing was found in a man, lately dissected here, as in her; except that the cavity which the blood had form'd for itself, in the hemisphere opposite to the paralytic part, though it had discharg'd some of its blood be-

(*e*) Epist. Anat. 13. n. 17.

(*f*) Dissert. de Deriv. & Revall. per V. S. § 29.

(*g*) Epist. modo indic. n. 24.

(*h*) In Epist. Dissert. citatæ subnexa.

(*i*) Epist. Anat. 13. v. 22.

(*k*) Adde quæ infra Epist. 11. n. 10.

(*l*) Vide quæ mox n. 18. (*m*) N. 2.

twixt the meninges, by breaking through the pia mater; yet had not, in like manner, communicated with the ventricle, though it was, in every respect, close to it. I had scarcely heard this account, when I receiv'd letters from Venice, which I still preserve; in these I was inform'd, by Alexander Bonis, a learned physician, and my worthy friend, of a fact, which he himself was witness to. A monk, while he was haranguing, was seiz'd with an apoplexy; he liv'd only four hours after his seizure, and mov'd only his left hand: in the left ventricle of the cerebrum were found, at least, two ounces of concremented blood: and the parietes of that ventricle were lacerated; whereas the other was entirely sound, and contain'd only a little portion of blood, which had flow'd from the left, by a rupture of the septum lucidum. This is the sacred orator, referr'd to in the former letter (*n*); and a little time after, when I went again to Venice, I heard this anecdote concerning him; that he had for many days before his death abstain'd from preaching, because he complain'd that he was far from being well: but that, on the day of his death, he had affirm'd to those about him, that he had never been better than at that time; and that he ascended the pulpit with great spirits and alacrity, to begin that discourse which he was not permitted to finish. This brought to my mind the case of king Attalus (*o*), who, "while he exhorted the Boetians to an alliance with the Romans, at Thebes, fell down half-dead, so that he expir'd soon after;" yet not some hours, but some days after: for (*p*) "he being carried in this diseas'd state from Thebes to Pergamus, died there in the seventy-first year of his age:" which age, join'd with infirm health, render'd him less liable to a violent apoplexy; if that be really a fragment of Livy, which was read in the beginning of the thirty-third book, in the old Bamberg Codex. For the passage runs thus: "Attalus spoke first. He had no sooner begun, than being too old and infirm to support the fatigue of speaking, he was silent and fell down, stricken in a part of his limbs: yet the force of the disease did not seem to bring on present danger of his life, but a debility of his limbs only."

But this monk was not more than fifty years of age, and in full strength; especially on that day, as the colour of his face, and the whole habit of his body, shew'd. When, therefore, to this fulness of blood, the energy of speaking was added, he was seiz'd with a violent apoplexy in the middle of his discourse, to which he soon fell a sacrifice, as I have already said in the foregoing letter (*q*), and just now in this (*r*).

18. You see, by attending to what I have said on a former occasion (*s*), that in determining the internal cause and event of an apoplexy, I not only consider the age of the patient, but other things also. A certain man, aged seventy years, but a stout healthy fellow, and by trade a blacksmith (*t*), died on the sixth day after an attack of the apoplexy, being paralytic in his whole right side. Yet the cause of it was found to be, black blood, extravasated from the rupture of a lateral branch of the left carotid artery; which had diffus'd itself all over the left hemisphere of the brain, and injur'd it

(*n*) n. 23.

(*o*) apud Livium Hist. l. 37.

(*p*) l. 33.

(*q*) n. 23.

(*r*) n. 12.

(*s*) Epist. 2. n. 14.

(*t*) Act. Helvet. vol. 1.

even to the very recesses of the ventricles. Other remarks occur'd, too long to be describ'd here. But we must not omit that remark of the very large tumour, which adher'd to the right kidney, and was fill'd with a great quantity of blood; and had also a kind of substance "made up of lamellæ lying one upon another," so as to give suspicion of an aneurism in some branch of the emulgent artery, to which the other lesser one (as I conjectur'd before, on the similar case (u) of Ramazzini) in the lateral branch of the carotid artery, corresponded. But of whatever nature the tumour was, this certainly ought not to be denied; that the aorta being press'd by such a weight lying upon it, could not admit its usual quantity of blood; and therefore, that a greater quantity than usual being of course carried to the head, the tender vessels of the cerebrum would be much more liable to dilatation and rupture. If, therefore, we should know, that in any apoplectic person there is a compression of this kind upon the descending aorta, the age of the patient, though never so great, should not prevent us from supposing, that the disorder may be sanguineous.

In the case of the Danish ambassador also, slightly mention'd before (x), there must have been some other peculiar disposition to be join'd with the liver, "inclin'd to hardness." For being threescore and four years of age, he was seiz'd with a sudden palsy of the left side, and presently after with an apoplexy, so that he died in eight hours; that is, sooner by far than the smith, a larger extravasation of blood having been made. And he had, besides many hydatids of the plexus choroides, in the right ventricle of the brain, "more than four ounces of grumous blood: by which the parts that form'd this cavity were greatly dissolv'd." And, at the same time, I would have you observe, that both these observations, if you consider the contrast between the side that was paralytic, and the hemisphere of the brain that was injur'd, altogether agree with the observations of Valsalva. And you will also find other observations that agree with them; and among those, that of a man (y), who, though he was very old, yet by constitution, and even formerly by his occupation, as well as by recent irregularities in diet, was dispos'd to a sanguineous apoplexy. But perhaps you will desire to know the reason of other things, which you observe in the cases given you in this, and the former letter, whether they were from Valsalva or me; or whether they were describ'd, or only hinted at, from any other author, not even excepting those two given in the thirteenth of the *Epistolæ Anatomicæ* (z), one of which was observ'd by Valsalva, and the other by myself: and you will probably ask, how it should happen, that in almost all these cases, but especially in those wherein preternatural cavities are mention'd, or conjectur'd upon pretty good foundation, which have had blood collected in them, or pour'd out from them; these cavities have been generally found in the corpus striatum, or thalamus nervi optici, or in both, or near one or both of them; and then generally attended with a perforation and laceration of one or both of these parts: and again, why these cavities were never produc'd through the posterior lobe of the cerebrum to the occiput; seeing, that

(u) n. 8. (x) n. 12. (y) Eph. N. C. Cent. 9. obs. 3. (z) n. 19 & 25.

in one example, related by Wepfer (*a*), they were carried through the anterior lobe of the brain, quite to the forehead: and last of all, since those instances are fifteen in number, why, in ten of them, the cavities should be on the right side; in two, both on right and left; and in three only, on the left. In fact, I believe, though it seems otherwise at first, that chance has had the greatest share in these matters: or if a longer and more accurate series of observations should shew that these things really happen'd so, for the most part; we must look for the causes of them, in the structure of the brain, or in the distribution of its internal vessels. Suppose, for instance, that about the parts in question, either a greater number of vessels, or those of larger diameter, should be distributed. Thus, upon cutting the corpora striata in pieces horizontally, I remember, sometimes, to have observ'd, in the external and anterior side of each, a kind of foveola or little pit, through which a blood vessel manifestly pass'd: and at other times, when I cut it obliquely and slowly, that in the same side, many red lines or streaks, that is sanguiferous vessels, appear'd; being parallel to each other, and thicker than in other parts. And the proximity of the cavities of the ventricles, seems to be one reason why less resistance should be given, to the perforation of their parietes. But when from these, or from other circumstances of this kind, you shall have conjectur'd the cause of those things, which you enquir'd after in the first and second place; you will be, perhaps, less solicitous about the third (*b*), when you consider, that the right parts of the body are accusom'd generally to more frequent motion than the left; and consequently that all the vessels of the right side, though remote from the limbs, are, by means of communication and consent of parts, us'd to contract more strongly, and be more largely dilated.

19. But in regard to the observations of Valsalva, so often mention'd and confirm'd, that if the left parts are paralytic, the injury is on the right side of the brain; and if the right, on the left; I don't see what else you can require of me. For you know very well, that whatever I had to say on this head, either of antient or modern explications, or of exceptions, or of additions, and of every other kind of matter relating to this doctrine, all these I have in general thrown together into that anatomical epistle (*c*) just now mention'd; so that it is needless to repeat them here. One or two things only, which respect those two first heads, I may just add: for if you happen to read Caspar Hoffman (*d*), who in regard to those ancient explications writes as follows; "This was the opinion of Aretæus before Galen, which Cassius Jatrofophista follows in his forty-first problem. Th. a Veiga also mentions. "Haly Abbates and Felix, which I have never seen; nay, I do not even "know who this Felix is:" I say, if you read this, I would not have you suspect, that in this Felix I have omitted any very ancient writer, who deserves to be mention'd with Aretæus and Cassius. For this very Felix, who is unknown to Hoffman, is the same with Cassius, sometimes call'd Cassius Felix, as you may know from Lindenius Renovatus (*e*).

(*a*) Sepulchret. Sect. hac 2. obs. 18.

(*b*) Vide tamen Epist. 11. n. 12. imo Epist. 52. n. 7. 9. 11.

(*c*) 13. ab n. 14. ad 27.

(*d*) Comm. in Galen. de usu part. 1. 10. c.

12 &c.

(*e*) de Scriptis Medic. 1. 1. vid. Cassius Felix.

But this respects the exceptions to, or at least the illustration of, the doctrine confirm'd by Valsalva; which is, that notwithstanding where one side of the body is paralytic, the disorder, if it be organical, and fall under the notice of the senses, is in the opposite side of the brain; yet it does not follow, on the other hand, that as often as any mischief of this kind is in one or the other side of the brain, the opposite side of the body must be paralytic; for by the same method of reasoning, this ought never to happen, which however sometimes does happen: I mean, that though the brain is injur'd on both sides, yet neither side of the body is paralytic; whether because these injuries are brought about without sudden laceration, or compression of the brain, or from any other cause. But this we will endeavour to enquire into, and explain, when we come to consider observations of that kind. At present, I shall give you the remaining ones relative to the sanguineous apoplexy, and refer the others to their proper places.

20. A man, pretty far advanc'd in years, had died of an apoplexy, not immediately indeed, but after many days. Whether he was hemiplegic or not, I could not certainly learn; much less could I learn, what was his habit of health before this attack. This only I was inform'd of, that when he lay in the apoplectic paroxysm, he had a strong pulse, but not a difficult respiration.

His body was given to the theatre, about the end of January 1731. The viscera being diligently examin'd, there was nothing preternatural in the belly; but in the thorax were some preternatural appearances, which, as far as it can concern any one to know, I will relate to you. The lungs were on all sides connected to the pleura. The heart was so fat, though the man was in no other respect fat, that looking upon the anterior surface of it, you could see nothing but fat. The valve of the coronary vein was every where fix'd, and pierc'd through with little foramina, as is describ'd in the fifteenth of the *Epistolæ Anatomicæ* (f). Last of all, the left vertebral artery took its origin from the curve of the aorta itself, betwixt the left carotid and subclavian. And at the same time that I shew'd its origin from thence, instead of the subclavian, whence it us'd to arise, I took notice that it was possible this unusual origin might be found, in some measure, to account for the apoplexy.

After some days, as the order of demonstration requires, when the cranium was open'd, I found and demonstrated blood effus'd, to the quantity of half a pound, betwixt the dura and pia mater; or rather between the dura mater, and another little membrane, the arachnoides; which membrane, being there made somewhat thick with the extravasated blood, was opposite to the anterior region of the left temple bone, and the parts thereabout. Besides, almost in the middle of the falx, was an ossification, within the duplicature of that process, near to the lower edge, lying longitudinally to the breadth of three fingers or more, and being almost an inch and half in depth, moderately yet unequally thick. For the whole circumference of it was thin, and at each of its extremities, seem'd to end in a simple stratum of parallel bony fibres; and on its right and left surfaces, but especially on the right, it had large protuberances like studs or bosses, as any body may see in my collection:

for I still preserve it, cover'd over, as it was, with the membrane of the falx, which adher'd very firmly to it on all sides. Finally, the posterior right branch of the carotids, which are at the basis of the skull, was thicker than was natural; but the left was very thin, nor join'd with those branches that go from the artery, with which the vertebrals anastomose. And although I have seen the first-mention'd appearance sometimes in other bodies, and even at that very time in the brain of a dropsical person, which we dissected; and though I have seen this great thinness of one or both arteries much oftener, and even the want of conjunction with the vessels spoken of above, which is a more rare phenomenon, perhaps more than once; I was, nevertheless, willing to inform you of these things, lest you should think I pass any thing over, that is worthy of remark.

21. As to other circumstances, and among these the universal adhesion of the lungs to the pleura, without any difficulty of breathing, I shall take another occasion to treat of them (*g*). I was much chagrined, upon finding so large an ossification in the falx, that no body could inform me, what complaints this man had made in the years preceding the apoplexy: for since Francesco Antonio Catto, a Neapolitan anatomist, first publish'd an account of the falx being in some part degenerated into a hard bone (*h*) (who, by the way, was not, as far as I see, so despicable, that he should be unknown to all those who have spoken of medical and anatomical writers, inasmuch as he was also the first who really publish'd a dissection of a bipartite uterus (*i*) in a woman) many other observations of the same kind have been also publish'd by several authors; as Botallus (*k*), Horn (*l*), Skeidius (*m*), Wepfer (*n*), Cheffelden (*o*), Vaterus (*p*), Gohlius (*q*), Mayerus (*r*); and many others, some of whose names I shall mention presently. Beside these, there are some given us in the history and memoirs of the Royal Academy of Sciences at Paris (*s*); yet, among all these, I do not remember to have read of a bone which could be put in competition with that above describ'd; if we except from so great a number of falces a few only, in one of which Riolanus (*t*) says, that the bone was four inches broad, and that which Volckhamer (*u*) found "in one half of its length entirely bony," but especially that which, in this very anatomical theatre at Padua, Offredus (*x*) saw "entirely bony." And you would imagine, that Henry Albertus Nicolai (*y*) had seen one equal to that of Offredus, did he not add that Volckhamer "had observ'd "the same," and Offredus "a similar one;" so that there is reason to doubt whether he meant the whole, or only a part of the falx, when he says, that he found it "entirely bony:" and there is also much reason for doubt from hence, that we read a certain observation, in which that very word "entirely" is omitted.

(*g*) Epist. 16. (*h*) *Isagog. Anat.* c. 20.

(*i*) *Ibidem*, c. 3. (*k*) *Obs. Anat.* 2.

(*l*) *Annot. ad eandem*.

(*m*) *Dissert. de duob. oculis in apoplect.*

(*n*) *Exercit. de loco affect. in apopl.*

(*o*) *The Anat. of the hum. body*, tab. XI.

(*p*) *Abr. in Diss. qua osteogenia, &c. in prom. & in progress. quo observ. calculor. &c.*

(*q*) *Apud eund. in cit. progress.*

(*r*) *Commerc. Litterar.* a 1731. specim. 42. n. 2.

(*s*) *A.* 1711, 1713, 1734, & 1706.

(*t*) *C.* 32. *Comm. in Gal. de ossib.*

(*u*) *Eph. N. C. Dec.* 1. a. 6. obs. 71.

(*x*) *Earund. Dec.* 2. a. 1. obs. 127.

(*y*) *Dec. Obs. Illust. Anat.* obs. 5.

But I was not so much disappointed, that nobody could inform me of what I desir'd to know, relating to the man in whom this bone was found, because I suppos'd, or now suppose, that he suffer'd any great inconveniencies from it, unless we should choose to believe, that some sense of weight, or distraction, must have arisen from thence: but rather, because I wish'd to confirm by my own observation, that very circumstance which I had gather'd, either from the silence, or the express declaration, of most of those authors mention'd; that unless the bones, form'd within or upon the falx, or in any other part of the meninges, not exceeding the bounds, in magnitude and weight, of those which they have found to this time; I say, unless their figure or situation be such, as to prick or irritate the meninges, they do not only generally not produce any violent disorder of themselves; but even not a constant sense of pain: so that I think, for these reasons, we should enquire, whether the observations of Volckhamer and Offredus, and others of the like kind, contain any thing in them, repugnant to the uses that are ascrib'd to the falx.

22. Yet I would not deny, but that bones of this, or of any other kind, preternaturally generated or encreas'd, may sometimes give occasion to internal disorders of the head; and particularly to the apoplexy, if other causes are added. For first, in an old man of Trent (z), whom, having been before attack'd with a slight apoplectic paroxysm, a succeeding and more violent one carried off in an instant, while he went to stool, scarcely an hour after taking a purging medicine; not only the ligament betwixt the os sacrum and the ischium was found ossified, as related in the third of the *Adversaria* (a); but I also saw a little bone within the very substance of the heart, in that place which one of the valvulæ mitrales cover'd, of a moderate thickness, but so long, that it exceeded a finger's breadth. The internal surface of the aorta was, in like manner, cover'd here and there with little bony plates; so that, if I had been allow'd to search into the more hidden recesses of the brain, it is very probable I should have found there other ossifications also. And, in the second place, it is not uncommon with me, in fact, to find in the brain of old persons, that the vessels frequently have their coats rigid, from the specks of beginning ossifications; and especially the carotids, where they make so considerable a flexure at the sides of the sella equina.

In heads of that kind it was, doubtless, that Cortesius (b) saw the preternatural appearance he mentions; though he himself sets it forth as if it were nothing but what was extremely natural: for he writes, "that in the cavity of those arteries, where they are contiguous to the pituitary gland, were contain'd two things worthy of observation, yet hitherto taken notice of by none; the first is, that there are some very small cells; the other, that there are some small bones," (*was Riolanus (c) also impos'd upon by such appearances afterwards?*) "like those which are found at the joints of the sin_{ers}, call'd ossa fessamoidea: but the arteries not only contain little bones in this part, but in others also, as experience itself has hitherto

(z) De quo Epist. 43. n. 28.

(a) Animad. 45

(b) Miscell. Med. Dec. 1. c. 7.

(c) Animad. in Bartholin. anat. 1. de venis c. 2. in fin.

“prov’d.” And he goes on to say, “that he thinks this was not done without the greatest providence of nature, which perpetually takes care that they be kept open and elevated, in such a manner, as to be able to support the dilatation.” I however see, that the circulation of the blood is so regulated in all parts, and especially in the brain, that if any thing arise from the force of disease, which delays the ingress or egress of the blood, more than was appointed by nature, and by that means renders its motion more slow, it cannot be without detriment to the machine: and the ingress of the blood is delay’d by reason of the arteries being less able, on account of these bony particles generated in their coats, to contract themselves, and press on the blood; and whatever streightens the diameters of the venous canals, or takes away from them certain kinds of diverticula, into which, on occasion, a part of the redundant blood may in some measure retire, actually delays the egress of the blood. So because, in the skulls of old men, the smaller foramina are obliterated by the over-growth of the bony substance; for instance, as I have elsewhere (*d*) taken notice, those through which the occipital veins communicate with the lateral sinusses; it happens from this circumstance, I believe, among others, that many are more liable to disorders of the brain in old age. But there are also many kinds of causes, which may streighten the venous canals; and among these, if we attend to Scheidius (*e*), are bones generated in the falx, which, “by drawing the process downwards, in some measure, by their weight, and stretching it, render the longitudinal sinus, which is joined to it, more narrow, especially in that part, and consequently prevent a free passage to the reflux blood.” And if it were credible, that this could happen from one of Scheidius’s bones, though very small, and not heavy; how much more likely is it, that it should happen from mine, which so much exceeded his, both in bigness and weight?

23. But in order that an extravasation of blood, within the cranium, should succeed a coarctation of this kind in the sinusses, as he had found in an apoplectic woman, he justly concludes, that from some cause or other, “the blood must necessarily flow in more copiously than usual.” And I think the same in regard to our apoplectic patient; and the more readily, as the blood was carried with a greater impetus into the arteries of the brain. For although, to moderate that impetus, the coats of the vessels are made thinner, as I said above (*f*), and therefore less fit to urge on the blood; and though anastomoses are form’d betwixt the carotid and vertebral arteries, and both of these arteries are more than once inflected in their course to the brain; there is still one more contrivance added to retund the impetus of the blood, that I would have you attend to with me: which is, that no other artery but the carotid, should arise immediately from the curvature of the aorta, and go to the brain; for nature has order’d, that the vertebrales take their rise from the subclavian, as we well know that the blood is dash’d with so much force against the arch of the aorta, by the immediate power of the heart, as to make it the most frequent seat of aneurisms. But the left vertebral, in our apoplectic man, did not arise from the subclavian, but from the curve of the

(*d*) Epist. Anat. 4. n. 11.(*e*) Diff. supra ad n. 21. cit. quæst. 4. & 5.(*f*) N. 9.

great artery itself; and ran, together with its fellow, into that artery, which, as I have said, form'd a large anastamosis with the right carotid, but none with the left; so that by how much more the impetus of the blood was broken and repress'd in the one, by so much less, or indeed not at all, was it counteracted in the other. With greater impetus, therefore, did the blood run through the left side of the brain; so that we need not wonder, if the very slender vessels of that side, being by degrees more and more weaken'd in their coats, and the coarctation of the longitudinal sinus being encreas'd by the bone before spoken of, the blood should be effus'd, not only on the left side, but anteriorly also, from whence it should have gone on into the sinus, at that part where the impediment was thrown in its way. I am not ignorant, however, that the same vertebral artery has been found to arise from the arch of the aorta in some bodies, not only by others, but by myself also (g), at other times; but whether the persons, when living, had been subject to disorders of the head, or not, I neither could know myself, nor do I remember it was observ'd by them. And we may venture to say the same thing of the large anastamosis of the basilar artery with one of the carotids, and not with the others. But I know that a little bone has been generated on the upper part of the longitudinal sinus of a man, who never complain'd of any pain in his head on that account (b); though, I suppose, the sinus must have been press'd upon, and streighten'd thereby: but I do not remember, that all those circumstances were ever found to concur together, as in the person we speak of at present. But we have now spoken sufficiently of this case.

24. A youth of Bologna, of fourteen years of age, who had black hair; and was subject to be troubled with worms, had been accusom'd, from the slightest exercise, or even from sitting by the fire, to have large hemorrhages from his nose; and having a habit of drinking spirituous liquors more than was proper for any body, but especially for one of his age, he became suddenly, and without any apparent cause, chang'd from a lively and brisk state, to a more dull and heavy one. After a few days, when in the morning he had convers'd in the family with his former cheerfulness and alacrity, and had even din'd among them in his usual manner, he was found afterwards extended on the bed, upon which he had vomited, compressing his head frequently with his hands, as if he felt great pain there, without speech, and very soon without motion. A physician being sent for, order'd a vein to be open'd, from which he seem'd to be a little better. Spirit of salt ammoniac was also apply'd to his nostrils, and a few drops given internally. Soon after he relaps'd into his former palsy and stupidity, yet seem'd to understand what was said, as he signify'd by certain nods. His pulse was low and intermitting; his respiration was bad; and he had some foam at his mouth. For these reasons, cupping-glasses were order'd to his back, which he did not feel; but on having them apply'd to his thighs, he felt them so much, that he cry'd out in a somewhat inarticulate manner, and endeavour'd to remove them with his hands. But those disorders we last spoke of still continuing, and the former disorders soon returning, he died about the ninth hour in the night.

(g) Epist. 15. n. 22. & epist. 56. n. 10, & 21.

(b) *Commerc. Litterar. a. 1737. hebdom. 34.*

Examining the body the day after, which was the twenty-third of December 1703, we observ'd, that the calves of his legs, and the back parts of his thighs, and other parts on which he lay, were very livid, by reason of the blood stagnating in them. And when I cut into the integuments of his head, which was the only part I dissected, more blood, and that more black and fluid than usual, was discharg'd. Only a few drops of the same kind of blood were found in the sinus of the falx, which was in every other respect empty. In the lateral ventricles, and in the third, some little quantity of serum appear'd. But under the cerebellum, the substance of which was more soft than it ought to be, almost in the middle, I found about two spoonfuls of black and concremented blood.

25. If I had describ'd this history to you among the first, as I did formerly by way of memorandum for myself, many more remarks would naturally have arisen, as well in regard to this last cheerfulness, as to the method of cure, and the dissection. But as those things are already spoken of in this letter (*i*), and the former also (*k*), it is to no purpose to repeat them here. It is sufficient just to hint, that if there be any difference betwixt this history, and any other of this kind given elsewhere, as that which is in the *Epistolæ Anatomicae* (*l*); this difference is to be accounted for from the place, time, manner, and quantity of the blood extravasated about the cerebellum; and from the quantity of blood compar'd with the magnitude of the cranium and cerebellum, which are various in various ages. But this history was put here among the last, that this, like the others, might answer, as far as possible, in order, to the histories of the sanguineous apoplexy, taken from Valsalva. But because this apoplexy may arise, not only from blood extravasated, but also from blood obstructed, and collected together, in the vessels of the brain; I will therefore give you an example of this kind, before I conclude.

26. Peter Fasolati, an engraver, at Padua, in the sixty-second year of his age, yet still of a full habit, and liable to no indisposition, died at the very same season as Tita (*m*), and even the very day after him, in the following manner. He had gone through no labour, had not been troubled with care and anxiety, as he had been us'd at other times, and made no complaint of any thing. He had even suppd heartily, for he always us'd to eat freely; and desir'd to go to bed more early than usual, which he did: but two hours afterwards, his wife happening to wake, found him not only dead, but even cold, and stretch'd out in the same manner he had lay'd himself when he went to bed.

The day following, when the integuments of the cranium were cut into, and while the upper part of the skull was saw'd through, and taken off, much blood was discharg'd. Yet there was none at all extravasated within the skull; none in the substance of the cerebrum, or cerebellum: and both these parts seem'd, to the touch, to be perfectly natural: there was, I say, nothing ruptur'd, nothing injur'd in any part. There was some water in the lateral ventricles almost limpid, but in small quantity; and some also seem'd to flow from the sides of the cerebellum, which was found, as I have

(*i*) n. 12.(*k*) n. 21 & seqq.(*l*) XIII. n. 23.(*m*) Vide supra n. 11.

said; or might it not come from the tube of the vertebræ? But such a quantity of fluid blood distended all the vessels in and about the brain, that I do not remember to have seen the like before: even some small vessels, which us'd to be scarcely perceptible, were extremely large and turgid (*). I order'd, however, that the thorax should be open'd also. The left lobe of the lungs was strongly connected to the ribs, but both of them were sound. The colour of the fat, in the mediastinum, was brown; which I attributed to the blood remaining in the smallest vessels. In the pericardium was some bloody water, but not much. The heart was large, and its proper vessels and auricles turgid with blood, which came forth very black and grumous, while the heart was cut off from its larger vessels, that I might examine it the more closely, out of the body. The blood was also black and grumous in the ventricles of the heart, yet not in very great quantity. The right valvula mitralis was white; and in like manner some of the femilunar valves: the former were much harder than usual, and the latter a little so: but in both mitral and femilunar, the membranous nature had degenerated almost into the nature of a ligament. In the middle and posterior surface of the heart, a kind of little membrane protruded, of a white colour, and look'd like the remains of an hydatid. On the right auricle externally, also, were some white spots. But the aorta and other vessels, as far as I could see, were according to their natural appearances.

27. It does not escape me, that you may think this man's death is rather to be imputed to a syncope, than to an apoplexy; as well when you consider the celerity of it, as the sudden coldness of the body at that hot season, and in bed; or even the appearances observ'd in the heart. But, to begin with these last, and to compare them with the quantity of blood found within the cranium; we certainly find greater marks of disorder in the hearts of those, who had not the slightest appearance of fainting, and much less the most violent syncope. And Galen has taught us, that an apoplexy may be form'd from such an abundance of blood within the cranium, though I have never seen any other case of the kind that I remember: Galen's (*α*) words are, "By this means apoplexies are brought on, to wit, by much blood rushing tumultuously into the principle of animation." Nor did Petrus Salius (*σ*), who first wrote a separate chapter on the sanguineous apoplexy, as I have mention'd in the former letter (*p*), imagine, that the disorder was, in general, brought about by other means, in the cerebrum, than from "too great a repletion of the veins, arteries, and sinusses, with blood; for "which reason a very great stricture is brought upon the brain, whereby, "not only the free passage of the spirits is prevented, but they are even "choak'd up, and suffocated thereby; so that sense and motion are suddenly "lost, and the intelligent faculties are suspended: that is, a true and exact "apoplexy succeeds." And, indeed, such a quantity of blood could not be collected in all the vessels within the cranium, but that the soft substance of the cerebrum and cerebellum must be violently compress'd, both from within and from without; the small vessels also, which escape the senses, be-

(*) Vid. etiam Epist. 60. n. 12.

(α) Vid. apud Salium de Affect. partic. c. 2.

(σ) Ibid.

(p) n. 1.

ing streighten'd, the circulation of the blood is intercepted; and consequently the secretion of spirits, which cannot happen without it, is prevented: for as there is no vacuity in the cranium, and the bones of it are incapable of giving way, the whole force of the pressure must be expended on the brain. These things cannot happen to the cerebellum, as it seems, and as I have already said (*q*), without a sudden suffocation of respiration and the motion of the heart, being the consequences thereof; that is, without sudden death: and this death, if you would rather have it so, from a syncope; but a syncope that would proceed from the head, and not from the heart; or if from the heart also, on account of the appearances spoken of, yet, at least, certainly more from the head, than from the heart. But wherever there is a syncope, from whencesoever it proceeds, there is no reason to wonder at the sudden coldness of the body: though I should rather suppose, that it was only a diminution of warmth, which seem'd to a woman who was herself warm, to be cold. And, as far as I can judge, you would not err much, if you should call that kind of syncope, which Herophilus (*r*) seems to have particularly pointed out, an apoplexy from the cerebellum: for he says, "When sudden death happens without any manifest cause, then it is owing to a palsy of the heart:" for what an apoplexy from the cerebrum does in other parts of the body, the same an apoplexy from the cerebellum does in the heart: but in an apoplexy which proceeds both from cerebrum and cerebellum at the same time, motion is destroy'd in all parts of the body at once. And such, I think, was the case under consideration, since there was evidently a material cause of compression upon them both; nor did I find that any of those symptoms had preceded, which are generally antecedent to a syncope from the heart, or any of its nearest vessels.

28. But if you say, that neither were any of those inconveniencies observ'd, which often precede an apoplexy; indeed I confess it: but at the same time I will venture to say, that it is less an objection to me, who account for this apoplexy, not from an organical disorder in the cerebrum, or cerebellum, but from blood collected, and condens'd, in the vessels of both. The man was extremely plethoric, which his habit of body, and plentiful manner of eating, sufficiently shew. He had eaten a full supper, and gone to bed sooner than usual; that is to say, with a stomach much fuller than usual, whereby he compress'd the aorta, which carries blood to the lower parts, so that a greater quantity of blood was necessarily thrown to the upper parts: and the quantity of blood carried to the head was so much the greater, as the situation of his body, in lying down, was so much the more convenient for its ascent, and the less convenient for its return, as we have already prov'd (*s*). And if the distended stomach does not itself press upon the trunk of the great artery, at least it presses its own arteries, and others that are branches of it, and resists the motion of the diaphragm; so that by making respiration more difficult, it renders more difficult the return of the blood from the head. Now call to mind what nature has done, that the blood should be carried with less impetus, and consequently with less celerity, and in less quantity, to the brain; most of which circumstances have

(*q*) Epist. 2. n. 24.(*r*) Apud Cæl. Aurelian. Chronic. l. 2. c. 1.(*s*) n. 13.

been already observ'd (t). For by this means, supposing all the data I just now mention'd, you will the more easily understand, that so much the more danger is there from congestion of blood in the brain, in proportion as nature has taken the more pains to avoid it. But if any one of those things, which nature has ordain'd, even from the very birth itself, being chang'd; as when the blood, by reason of a shorter passage, is carried with more impetus to the brain, as in those who have short necks, (*parvicollis* Cælius (u) call'd them) and are therefore liable to the sanguineous apoplexy; not only congestions of blood in the brain, but even ruptures of the vessels easily happen; how much more easily then will they happen, when many things shall be chang'd, at the same time, in such a man as we have describ'd! For let us also add to those things that have been said, this also, which is gather'd from the observations of Ridley, and my own, formerly pointed out (x); and drawn from some diverticula, as it were, and duplications of the sinusses, and their situation, especially in the basis of the skull. For as all these circumstances, and others, to which we must also add, that remarkable dilatation, at the beginning of the internal jugular vein, have a tendency to retard the motion of the blood returning from the brain; so some certain causes of delay are also encreas'd from the very position of the head in a supine posture of body, and the greater occasion is given to congestions of blood in the brain. And this, I think, leaves us at no loss about the reason, why, of those who die suddenly on account of the difficulty of its motion, whether that difficulty of its return be from thickness and lentor, or from plenitude, most of them are found dead in their beds.

29. But perhaps you will say, why did not this apoplexy happen before, since the same circumstances were before in the brain, and he had not only supple'd heartily very often, but doubtless had gone to bed very early sometimes? Certainly because, though most things were in the same state in the brain before, yet by no means all. Nor do I speak of the strength of the vessels only, which in old men is diminish'd more and more every day, but of the season also, and of this chiefly; by the force of which, in those days, many others were so frequently and so suddenly snatch'd away. For after the cold, not only in the winter, and even in the preceding autumn, but protracted by an extraordinary continuance through the long spring that succeeded it; the heat then, for the first time, brake out, and that not gradually, but violently, and all at once; so that the blood, for this reason, expanding itself suddenly, the same thing happen'd, as if the vessels were suddenly distended with a double quantity thereof. But this being sufficiently explain'd above (y), there is no occasion to repeat the explication here.

30. It is better, if any observations have come abroad besides these which are pointed out, up and down, in this letter, relative to the sanguineous apoplexy, to point them out also; not all indeed, but only those which at present occur to my mind.

On the persons of princes three observations are at hand, two of which are mention'd from Dionysius, in the *Acta Erudit. Lipf.* (z) and were from blood

(t) n. 23. (u) l. 2. cit. paulo supra c. 12.

(x) Advers. 6. Anim. 6.

(y) n. 13.

(z) A. 1711, M. Septembr.

extravasated in the ventricles of the cerebrum; the third, in the *Commercium Litterarium* (a), and was from a congestion of blood in its veins and arteries, by reason of which the whole brain beneath the pia mater was turgid and livid. To these two we may add that which we read in the Acts of the Cæsarean Academy (b), of a shepherd's wife; and two others, perhaps, which Dominic Gagliardi (c) has given us; the one in a fat old man, who had scarcely any traces of a neck, and was too much addicted to drinking spirituous liquors; the other, in a man who had imprudently stopp'd a hemorrhage from his nose, by astringent powders. But this one at least we must certainly add, as it was made by the person himself who relates it. The case was of a plethoric priest, who while he was asking assistance from a physician for an obstinate pain in his head, fell down dead as he spoke; so that he in vain took out a penknife to let him blood: and the lateral ventricles were found to be extremely full of blood. This physician was Jo. Baptist. Molinario, whose excellent book, entitled, "*Specimen de Apoplexia*," (d) I should on other occasions have commended, if it had been publish'd at the time that I wrote these letters to you. And these observations also came out after the second edition of the *Sepulchretum*. But one among the rest was publish'd before it, in which, though the apoplexy was from an external cause, yet for this very reason it deserves to be related here. For who would easily have imagin'd; that a country-boy, being lay'd hold of by the hair on the crown of his head, by his enrag'd schoolmaster, and suddenly drawn to him with violence and shaking, should for that reason only, be made apoplectic, and die the following night? Yet Slevogtius (e) saw it; and found out the cause. For the pericranium on the crown of the head had been pull'd away from the periosteum, and he found blood largely extravasated on the dura mater; and from the vessels that connect this membrane to the parts beneath it being ruptur'd; blood was effus'd within the lobes of the cerebrum, and had penetrated quite down into the ventricles. And now you have this addition also to those things, that I had promis'd you, concerning the sanguineous apoplexy. If I find that you think it not altogether useless, or unpleasing, I shall then more readily go on to consider other things. Farewel.

LETTER the FOURTH.

Which treats of the Serous Apoplexy.

1. **W**HEN I said in my second letter (a), that the celebrated division of apoplexies into serous and sanguineous, was not to be rejected; I was not unaware of the reasons, which prevented some of the most learned men, both among the ancients and moderns, from acknowledging the serous

(a) A. 1744. Heb. 3. n. 2.

(b) Tom. 3. cbs. 121.

(c) Dell' Inferno illustrato. p. 2. Veglia 22,

(d) Part. 2. f. 1. n. 9.

(e) Diff. de dura matre, § 14.

(a) N. 6. & seq.

apoplexy. Nor, indeed, am I in the number of those, who when they find a little water within the skull of an apoplectic person, immediately conclude that this was the cause of the disorder. And I even give you leave to suppose, that of the observations produc'd here from Valsalva's dissections, or mine, as many as you please should be refer'd to another origin; so you will but grant me these things in return: first, that though it happen'd to Varolius, as I have said in that letter (*b*), that in the bodies of apoplectic persons which he chanc'd to dissect, "no greater quantity of recrementitious matter was found in the ventricles of the brain, than was generally found in all others," yet that it happens quite otherwise in many. Secondly, that this water, though it is not the cause of the disorder in some, yet encreases it; and for that reason, ought neither to be unknown to, nor neglected by, the physician. Lastly, that not only a great quantity, but sometimes even a little water, may be the cause of an apoplexy; and that not in one way only, as I shall endeavour to prove now and then in the proper places. And if you attend to all these things, I believe, you will very well understand, why I retain this division of apoplexies, and with what intention I send you so many and so various histories, beginning, according to custom, with those which I find in the papers of Valsalva.

2. Who Valerio Zani was, you know from many circumstances, but especially from our life of Valsalva: and you shall now hear many other things of him, which relate to the present case; and these were so much the more accurately remark'd, as Valsalva was with him often, even almost every day.

Zani's father had died of an apoplexy; and his uncle, when he was more than three-score-and-ten, of a stone in the bladder. He himself was of a gross habit of body; his muscles were soft, his neck short and fleshy, and his face very red. He was addicted to a sedentary life, and close literary application; and was also accusom'd to high living, as noblemen generally are. In the forty-first year of his age, he began to be troubled with the stone, and discharg'd many; and at the same time had a constant discharge of salt saliva, which afterwards rotted all the teeth out of their sockets. Before the completion of his sixty-first year, the salivary discharge left him; but he was now and then visited with pains of his head, which occasion'd a great heaviness therein. At length, about the sixty-third year of his age, which he never completed, after having very strictly observ'd the solemn fast of forty days, which in former years, by reason of his dubious state of health, he had neglected to do, he began to complain of a pain in making water; and this pain afterwards became more violent, and for the most part periodical: for it return'd almost every month, and sometimes oftener, after making a large quantity of watry urine, and especially at the time of finishing the discharge, this discharge being also attended with difficulty; and thus it lasted many days. Besides these symptoms, he was also afflicted with heavy pains in his head, after having had his mind affected with any emotion: and a dullness of his senses, last of all, came upon him, with a debility of motion in his right side. As autumn drew nigh, his legs swell'd, and became cedematous; and the right leg having the skin a little eroded, emitted a great

quantity of liquid serum; which coagulated with heat, and resembled the white of an egg. Yet the patient was so far from being reliev'd, by such a great discharge of serum, that, on the contrary, he grew much worse. For he first became sleepy; then the winter solstice approaching, and the south wind blowing, he was found speechless, his right side being almost immovable; nor indeed was it mov'd at all, unless pinch'd pretty sharply, and even then but little. After taking some drops of spirit of salt ammoniac, he could again speak, and pretty readily move his right side; but in a quarter of an hour after, he was again stricken speechless, yet shew'd that he understood every thing which was said; and even sometimes himself brought forth a word, but with great difficulty of utterance, and a low voice. At length, on the fifth day of this kind of apoplectic disorder, he died.

His belly being open'd, the stomach was found to be turgid with air, the kidneys were very soft but found, and the bladder was found also; yet in it was contain'd a stone, as big as a pullet's egg, and nearly of an oval figure, somewhat depress'd: its surface was very rough; its colour not white, as in that of his uncle, but reddish.

In the thorax the lungs had a natural appearance, except that they were a little redder than usual. The heart was large, and in its left ventricle was the slight beginning only of a polypous concretion; for the blood was so fluid, that a little before, when a branch of the iliac was cut by accident, it burst forth almost as in a living man.

Having saw'd through the skull, the dura mater appear'd corrugated; but under the pia mater, within the sulci or furrows of the brain, so limpid a serum stagnated, that this membrane, before it was cut through, resembled a transparent glass. There seem'd also to be a greater quantity of that serum in the right hemisphere, than in the left. A serum of the same kind was likewise found in the larger ventricles, to the quantity of two ounces; and this was of a saltish taste. And although of all that serum which was within the cranium, not much, especially in a pure state, could be collected, yet it was divided into three parts: and one of these, being put upon the fire, evaporated away perfectly; another, being mix'd with spirit of salt ammoniac, and gently shaken, precipitated in a little time to the bottom some blood which happen'd to be contain'd in it; but the third, being mix'd with spirit of vitriol, suffer'd no change. In the right ventricle, the plexus choroïdes had a vesicle of the bigness of a filbert; and in the left it had also some small vesicles. Finally, both the carotid and vertebral arteries shew'd every where, in their internal coats, white and firm corpuscles, lying at some distance from each other; but they were not all of equal firmness, for most of them were almost of the nature of a cartilage only, whereas some approach'd nearly to that of a bone.

3. Zani was afflicted with two diseases chiefly, and both of them seem'd to be hereditary. But as to the stone of the bladder, we shall consider that in another place (c). At present, we will attend only to what relates to the imperfect kind of apoplexy, of which he died. Valsalva imagin'd, that the cause of this disorder was to be sought for in the extravasated serum: and he

had determin'd formerly, as I have learnt from his papers, to make many experiments about the cause of the apoplexy. For instance, whether it could be artificially brought on, by throwing into the carotid arteries of beasts this or that thing: whether these arteries being tied, the animal would nevertheless feel: whether the blood of apoplectic persons differs from that of others, and in what manner: finally, what is the fault or depravity of the serum, so often effus'd within the skulls of apoplectic persons; and what is the difference betwixt this and that which is often found, in like manner, extravasated in the pain of the head. You see how he endeavour'd to examine this serum in Zani, nor found it coagulable by heat, as some think, and as that which had flow'd out of the foot before, actually was. And at the same time you understand, how much care must be taken that nothing be mix'd with the serum, and how easily blood may be mix'd with it in dissection; but especially, how long a series of experiments is requir'd, and how cautiously and ingeniously collected. While these are wanting, if we may be allow'd to use conjecture, and attend to that which is pretty manifest; it is not incredible, that from a serum of this kind, both pain of the head and apoplexy is brought on; but the one or the other, according to its various quantity and acrimony; and the apoplexy finally after the pain. So you have in the Sepulchretum (*d*), the case of a matron, who had long been subject to a hemicrania, and who was at length taken off by an apoplexy, in whose cranium were found "about five medicinal pints of a yellowish, and moderately salt, water." Compare this matron with Zani, and both of them with the man mention'd in the first letter (*e*), who had pains of the head first, and then an apoplexy, and within whose skull we describ'd water being found, both upon the cerebrum, and in it. Nor are we to suppose, because the saltness of the serum was not mention'd in his case, that therefore it was wanting; but rather that it was not enquir'd after. Nor is my conjecture to be slighted, because it was not in so great a quantity in either of these, as it was in the matron, till you have read the next history, and the remarks I shall make thereon.

4. A public professor of law at Bologna, about sixty years of age, whose face was of a red, inclining to a leaden, colour, had complain'd for a month of a kind of weakness, or pain, at his stomach, by which his strength was so much diminish'd, that he was forc'd to rest himself often, though he walk'd but a very little way; for rest gave him ease. At length it happen'd, on the fourth day after the first quarter of the moon in March, when the south wind blew, and he sat in the great church of Saint Petronio, that he suddenly fell down with a confus'd kind of howling, and a certain peculiar contortion of body. His face was very livid; he foam'd at the mouth; the fœces were discharg'd; and not the least motion appear'd. He therefore died in less than an hour.

Soon after death, his face grew pale; yet after twenty-four hours, some lividness still appear'd behind his ears, and in other parts of his body. While the brain was taken out from the cranium, a little quantity of serum ran out. The sanguiferous vessels of the brain were not very turgid; but at the sides of some of them was a gelatinous concretion of serum. The pia mater

(*d*) L. 1. sect. 2. obs. 45.

(*e*) N. 4.

was easily separated; the whole cerebrum was extremely flaccid, and look'd of a dilute colour: in the lateral ventricles was a little serum, scarcely worthy notice, which was also of a saltish taste. The chest being open'd, the lungs seem'd to have been dy'd, as it were, with ink, yet were not connected with the pleura. In the pericardium was a proper quantity of water, with a flaccid heart; and nothing in its ventricles worthy of notice. Near to the heart, the aorta had some little bony scales.

5. Valsalva did not examine the abdomen, I suppose, because he thought that disorder of the stomach, as the patient call'd it, was owing to the flaccidity of the heart; for in most of our cities, people who are ignorant of anatomy, mean by the word stomach, the lower and anterior region of the thorax, where the heart is situated. A heart of this kind, indeed, does not seem to have been very able to propel the blood; especially in walking, when it is thrown more hastily through the heart: and perhaps the black colour of the lungs was also owing to the weakness of the heart. However this may be, the apoplexy, which carried the patient off in so short a time, might arise from that serum, though in so small a quantity; inasmuch as, by reason of the flaccidity and weakness of the heart and brain, he was less able to resist its pressure; and inasmuch as the serum, by its saltness, might vellicate the pia mater, with which also the ventricles are invested, so as to create at first a kind of epileptic paroxysm, which presently degenerated into an apoplectic one. For as Martianus (*f*) justly says, "it is not contradictory to suppose, that one and the same humour should sometimes bring on an epilepsy, and sometimes an apoplexy; since it is every day observ'd, that most epileptic patients are taken away by a succeeding apoplexy:" and there he not only teaches, "that convulsive motions depend upon a stimulus in the brain," but also, that Hippocrates "judg'd it impossible that the brain should not be convuls'd, while it was irritated by that acrid matter." And indeed, in the passage of that most ancient writer which he quotes, it is expressly said, "that if the brain be irritated, an apoplexy is the consequence; for the senses are thereby destroy'd, the brain is convuls'd, and the whole system of the man is overturn'd." You see, therefore, that it is not altogether repugnant to probability, if we think, agreeably to the opinion of so great men, that an apoplexy may be caus'd by even a little serum, so it be but irritating; which will bring on a convulsion, and consequently a constriction of the meatus, or tubes, of the brain. And from hence you will know, in what manner I think four or five very short histories of Valsalva, which I shall immediately subjoin without any remark added to them, may be in general explain'd. For whether you read, that with a pretty large quantity of serum, neither a perfect apoplexy, nor a very sudden death, was join'd, as in the two first of them; or you find that with a very little serum, it happen'd in the same manner, as in the third; or in a quite different manner, as in the two remaining observations; you will suppose, that in every one of those, I do not so much regard the great or small quantity of the serum, as a suppos'd saltness and acrimony, in different degrees.

(*f*) Annot. in l. Hippoc. de Gland. vers. 103.

6. A slender man, of forty years of age, labour'd under an acute fever. About the ninth day, in the night, he lost the power of speaking. And being spoken to, he did not give the least sign of understanding. In all his limbs only a slight faculty of feeling and motion remain'd. His face was not red. At length he died, about the thirteenth day. The brain was found in every respect natural; except that serum stagnated betwixt that and the meninges; and the ventricles were also full of it.

7. Another man, of sixty years of age, of a fallow complexion, had long been afflicted with ulcers in his legs. These being almost dried up, he was seiz'd with an aphonia, or loss of speech; together with a stupefaction, and dullness of his senses; and the day following he died. Serum was found betwixt the meninges of the spinal marrow and the brain; and in the ventricles of the brain also.

8. A woman, who had been deaf before, on the last day of December lost the power of motion; and her pulse also on the same day. Her whole body was cold; unless that the left side, especially upwards, retain'd some little warmth. Sometimes she breath'd quicker, sometimes slower; but she had more generally an easy and quick inspiration; but her expiration was querulous and slow. Thus she liv'd three days. In the body, after death, the blood was all fluid. In the ventricles of the brain was a little thick kind of serum.

9. A woman, aged fifty-seven years, was seiz'd with a febrile chillness, to which a heat attended with thirst, a sense of pain, and weakness in the whole body, succeeded. This fever attack'd her twice a day with the same symptoms: and on the second day her pulse intermitted; but on the third the intermission ceas'd. On these days she made much water, which was like that of a healthy person; but the quantity diminish'd, as the disorder proceeded. On the fifth and sixth day, the fever recurr'd, not only twice, but three times; and was very much exacerbated by a difficult respiration, a pain in the head, a great thirst, and a very parch'd tongue; which, however, had a good colour. In the night succeeding the sixth day, the woman slept well, and in the morning she rose to have her bed made; and then, from her own confession, her strength and spirits were good. The fever which us'd to return in the morning, did not now return: the pain of her head was entirely gone; and the patient seem'd to herself to be recover'd from her disorder: the pulse gave good resistance to the pressure of the fingers; yet the face had somewhat of a cadaverous appearance. She ate her dinner very well; yet her thirst was greater than usual. Then she talk'd with a female acquaintance, in a very sprightly manner. But this woman was scarcely gone, when her daughter returning into the chamber, found her dead. The bed was wet with urine.

The skin of the carcase was almost universally cover'd with purple spots: especially on the back and limbs. The belly being open'd, the stomach was found contracted; the intestines and kidneys were somewhat turgid with blood; the spleen was flaccid; and the gall-bladder contain'd but a small quantity of bile. In the thorax, the lungs no where adher'd to the pleura; but were turgid, and had here and there black spots on their surface; but on the back part were universally red with blood. The right ventricle of the heart

heart had a small polypous concretion. But the blood was here, and every where else, extremely fluid. When the skull was saw'd through, and the brain divided from the spinal marrow, a thick kind of serum flow'd out. About the pia mater was a gelatinous concretion; and in the ventricles a little serum. The brain itself was somewhat flaccid.

10. Although I intended to have made no remark upon these five histories of Valsalva; yet I cannot help wondering a little, as you I suppose do, at the unexpected death of the woman, after so great a remission of the disorder. For though I must confess, that the disorder bore considerable marks, not only of being violent and acute, but of being malignant also; yet that sprightliness and strength, which are describ'd in the patient, when she was just on the borders of death, do not seem much to agree with that malignity. But if we consider all the circumstances attentively, there were other things which might have warn'd the physician, whoever he was, not to trust that remission of the disorder; but even, on the contrary, to be the more suspicious of danger. The woman was better. But whence was that unusual thirst? whence that cadaverous appearance of the countenance, which should be always attended to? in short, what critical evacuation had been made from the body of the patient? and what good omens had preceded it, that this great change should not seem unnatural, and unexpected? Doubtless that deprav'd matter, which, being dispers'd through the body, had, by its irritation, given occasion to the general disorder, was collected into one part, and that the most excellent, the brain. For this matter had not been opportunely check'd and corrected, by the use of the Peruvian bark; which, at that time, it was not the custom to give against fevers of this kind: and I very well remember, that I have, by the use of this medicine, happily prevented the return of some kind of apoplectic fits, which attended a malignant fever, that had periodical returns; which fits would, doubtless, have otherwise return'd, and prov'd fatal, as they did in those with whom this method was not taken. Instances of this kind you will have on another occasion (g), in the noble count M. Antonio Trenti, and his eminence the cardinal Francesco Barbadici, bishop of Padua. But, to return to our history: there is room to doubt, I think, whether the matter, which by irritating, and bringing convulsions on the woman's brain, became the cause of her death, was in small quantity or not; since not only serum was found in the ventricles; but also, beside a gelatinous concretion about the pia mater, a thicker kind of serum was seen: and this, perhaps, flow'd out from the fourth ventricle, while the brain was divided from the spinal marrow. Nor is the history of the lawyer, which I have describ'd above (h), free from a like occasion of doubt. I shall now, therefore, give you a fifth history, which is common to Valsalva and me: it is of that citizen of Bologna, of whom, on account of a difficulty in hearing, and the cause of it, mention is made, in the seventh of the *Epistolæ Anatomicæ* (i).

11. This citizen was about seventy years of age, of a pallid countenance, had a difficulty of hearing, and was sometimes liable to a vertigo, and faintness: he had also a tremor, which was attributed to his having handled

(g) *Epist.* 49. n. 30. 31. (h) n. 4. (i) n. 6.

quicksilver for many years past: and last of all, he had a large intestinal rupture on the right side of his scrotum. But, in other respects, he was healthy and robust; so that he frequently indulg'd himself in the pleasures of venery, with a wife who was in the prime of her life. And this he had done the day before, when, being very sprightly, and sound, both in body and mind, he walk'd abroad with a friend; but scarce had he parted from his friend an hour and half, when he was found dead in the road. We observ'd, that the upper limbs were very rigid and contracted after death; and that even then there was a little heat about the lower ribs on the right side, though four and twenty hours had elaps'd since death. The abdomen we did not open; but diligently inspect'd all the viscera and vessels of the thorax, and found them all sound. In the head, we observ'd the mouth to be distorted to the right side, and on the same side we observ'd also a large blackness; but whether it was from the blow in falling, or from the blood settling there, from the position of the head, I could not determine: indeed the blood was found, in general, to be very fluid; but there was no appearance on the skull, or within it, which corresponded with that external blackness. The brain was rather soft, flaccid, and discolour'd; and in it a little serum was observ'd, but more upon removing the dura mater, than in the ventricles. The plexus choroides were beset with turgid vesicles, as they frequently are. And in the left vertebral artery, very near to its anastomosis with the other arteries, were thin small plates, some resembling a tendinous, some a cartilaginous, and others a bony consistence.

12. If you set aside these last circumstances, and other things, which, though they may be in some measure necessary to the cause of an apoplexy, are nevertheless found in many who are not apoplectic, then that little quantity of serum will remain, to the acrimony of which you may refer the cause of the convulsion of the brain; which was sufficiently indicated by the rigid contraction of the upper limbs, and the distortion of the mouth.

In those fifteen days, which happen'd in May, 1740, when many of the inhabitants of Bologna were carried off by apoplexies; it is not very wonderful that this man should fall a sacrifice to the same disorder; since he was sometimes subject to a vertigo, and languor in his strength, but always to a tremor: and moreover was, for his age, so intemperate in venery. I am very sorry that I have forgotten, what was the nature of the season at that time, and the one preceding it. But as this is the month when, in Italy, the heat, which was before mild, is wont considerably to encrease; it is probable that this May might, in many circumstances, agree with that which we have spoken of (*k*) in the year 1729; especially as some of the apoplexies had a very different cause from this man's; that is, blood extravasated within the cranium: in which number was that of a noble senator of Bologna. But as Valsalva has left nothing more relating to the season than I have remember'd, I shall omit this consideration, and subjoin my own observations to his, as I intended: beginning with a very great man.

13. Jo. Baptista Anguissola, that excellent prelate, was of a large stature, a ruddy complexion, and liable to disorders of the urinary passages. The

(*k*) *Epist.* 3. n. 11 & 13.

year 1707 was his sixty-first year, when having dried up an old ulcer of his leg, he was first seiz'd with a fainting-fit, as he was row'd in his gondolè; for he was then at Venice, upon an embassy from the pope. After that, he fell down at home in his chamber, without any apparent cause; and last of all, was seiz'd with an apoplexy: so that the physicians already foretold a speedy death. But though these things all happen'd about the middle of July, he did not however die till the middle of August. In the mean while, they gave him purging medicines: he was let blood in the foot, the arm, the hand, and the forehead: epispastics and vesicatories were applied to the skin, and cupping-glasses to the crown of the head: spirits, as they call them, and other things of that kind, were administer'd. Yet, they could never bring back the patient to his speech, nor recover the motion of the right side, which was paralytic. In the mean time, a fever came on, of the putrid kind, against which the Peruvian bark was made use of. There was also a suspicion of an inflammation in the thorax. Lastly, under one side of the chin, an abscess was form'd, which was open'd some days before his death; but it did not discharge much. At length the stertor, which had before frequently attended, becoming more troublesome, he died. These accounts I had from his intimate friends, when they desir'd me to attend the opening of the body; which was perform'd by the Rinaldi's, both father and son, in the presence of other physicians.

The abdomen being open'd, the convex surface of the liver appear'd mark'd with long lines of a red colour, degenerating into a brownish one, which reach'd from the upper part to the lower; but it was in other respects found, except that the gall-bladder contain'd three or four calculi, as I have also taken notice in the first anatomical epistle (*l*). The other viscera were all entirely natural, except the urinary bladder, which seem'd to be much thicken'd in its coats; but this might, perhaps, be partly owing to its being more than usually contracted. In the viscera of the thorax nothing morbid appear'd; for the lungs were neither hard, nor turgid, nor connected to the pleura: yet some did not scruple to find fault with the appearance of them on the posterior surface, which was black. But this I thought was unjust; and you will think so too, because you know very well, that this is common to all dead bodies; the blood by its natural gravity, in the supine posture of the body, all flowing together there. And this Christopher Guarinoni (*m*) formerly hinted.

While the integuments of the cranium were taken off, a redness was even then observ'd in the pericranium, where the cupping-glass had been fix'd. In cutting through the cranium, some water flow'd out from its cavity: and the skull being taken off, and the dura mater remov'd, a sort of ash-colour'd jelly shone here and there through the pia mater, lying upon the convolutions of the brain: and the vessels that ran upon the surface of the cerebrum and cerebellum, were a little more turgid with blood than usual. In the substance of the brain no disorder appear'd, except perhaps a laxity thereof. In the ventricles, however, I saw some water, but not much.

(*l*) N. 48.(*m*) Vid. Sepulchr. l. 4. f. 1. in addit. obs. 8. & 13.

14. The turgid state of the vessels, in this prelate, brings two things to my mind. As to that which I have already observ'd above (*n*), that a little water, so it be but irritating, might bring on an apoplexy, and that this depended upon its convulsing, and consequently constringing, the meatusses of the brain; I would have you now add to this, that the constriction will be so much the more dangerous, as it may also happen, that these meatusses, or tubes, are already, or shall be, constring'd from another cause, at the same time; suppose, for instance, from the blood, with which all the vessels within the cranium are more than usually distended. And hence you will easily conclude, how far we are to receive what renown'd physicians have taught, that venæsection is not only uselefs, but pernicious, in the serous apoplexy, and that in the same degree, in which it is useful in the sanguineous; explaining that passage of Celsus (*o*) so as to support their opinion, "if all the limbs are extremely paralytic, taking away blood either kills or cures." And indeed we cannot deny, that if an apoplexy be from water only, it would be equally absurd to attempt the cure of it by blood-letting, as the cure of an ascites. But where the great distension of the blood-vessels encreases the constriction, which is made by a small quantity of water, will not taking away blood safely diminish the constriction?

15. We are not treating here of the dropsy of the brain, in which there is a great quantity of water, and but little, and that an impoverish'd blood; so that, if you diminish its quantity, the vessels are compress'd by the weight of the water, and the languid circulation of the blood is entirely intercepted. For in this case the blood must be strengthen'd, and the fibres of the cerebrum and cerebellum also, which are lax, as if they had been macerated in water: so that it is necessary to use internal and external corroborants, as far as they can be us'd with safety, to obviate these inconveniences; which method, as I have justly asserted (*p*), must utterly be avoided in the sanguineous apoplexy. Therefore, as an apoplexy may be brought on from an ill habit of body, I would not hastily and rashly fly to that kind of remedy, from the abuse of which a bad habit of body is often brought on, and in consequence of that bad habit, an apoplexy: for you have it in Zacutus (*q*), that an apoplexy arising from this cause, after immoderate blood-letting, was remark'd both by Galen and Avicenna; and there is also an observation of the celebrated Trew (*r*), which may be referr'd to the same class. Nor would I fly to this remedy, if any one, especially an old man, and weak, who labour'd under a disorder proper to the head, and not from sympathy with other parts, having been sent by incautious physicians, whose opinion I always resisted, when it was in my power, to drink acidulated waters, should be seiz'd with an apoplexy on his return from thence. For you will read, in the Sepulchretum, that confirm'd by observation which my conjecture points out; to wit, that "the brain is then diluted with much water." But on the other hand, when I conjectur'd, that, beside the water, there was a turgescency of the vessels, I did not defer blood-letting. Thus in a priest, my fellow-

(*n*) N. 5. (*o*) De Medic. 1. 3. c. 27.

(*r*) In Ast. Nat. Cur. tom. 4. obs. 136.

(*p*) Epiit. 3. n. 11, 12.

(*s*) L. 1. f. 2. obs. 48.

(*q*) De Medic. Princ. Hist. 1. 1. hist. 5. in

citizen, (whose younger brother I hear was taken off by an apoplexy, while I wrote this letter) who had been subject every year to convulsive affections of the hypochondria, and had been wont to be freed from them by watry stools; in the year 1711, these watry discharges having begun, but suddenly stopping, and a heavy pain of the head coming on, attended with a stupor of the senses, and a loss of speech; I order'd, immediately on being call'd, a vein to be open'd in the arm: and while the blood was yet flowing, he recover'd the power of speech, and soon after the vigour of his mind; nothing else which was proper being omitted, and blood-letting being repeated the same day. For I was led to conjecture, that part of the serum which had us'd to be discharg'd by stool, but was now stopp'd, was effus'd into the cranium; yet I also believ'd, that the sanguiferous vessels of the abdomen were constring'd, as is generally the case in those convulsive affections of the hypochondria; and that for this reason, the vessels of the brain were more distended with blood. The same practice I have follow'd in others with equal success; and should have done it in those whose histories I shall next subjoin, if I had happen'd to have been call'd to them, or rather, if the suddenness of the disorder would have given time to attempt any method of cure.

16. There was a young man at Venice, of twenty-nine years of age, crooked, and much given to drinking; who made it his business to carry some kind of provisions up and down the city, and sell it to the lowest of the people. As he was doing this, on some day in October 1707, he first stagger'd in the street, presently fell down, and immediately died. His face was livid, and the wine he had drunk flow'd out from his mouth and his nose, together with a bloody fluid. Examining the body the day after, with the celebrated Santorini, we found the arms cold and contracted: the body itself had a most filthy and deform'd appearance; and moreover, there was a recent cicatrix of a bubo in the groin. We then cut into the belly: the liver and spleen were enlarg'd; but the latter was flaccid, and the former hard, and somewhat white. The pancreas also was hard. The stomach stretch'd the antrum pylori, as it is call'd, downwards; so that it lay exactly under the navel: and the arch of the colon; which is wont to lie under the stomach, descended below the navel, through the middle of the belly longitudinally, and was very narrow. But all the vertebræ, which ran from the lower part of the neck to the os sacrum, were far more unnatural in their situation. For the whole tract of the spine, between these bounds, was bent so much to the left side, that the middle of the curvature was more than seven inches distant from a right line drawn between these two points. Besides, the anterior surface of the spine was so turn'd to the left side, that the posterior processes were almost on the right. From which position it follow'd, that the beginnings of the left ribs cover'd the spine behind; and thence bending themselves immediately inwards and forwards, and embracing the side of the spine, they left that side of the thorax very much confin'd betwixt themselves and the spine, so as to resemble a very narrow fissure only. The descending aorta also naturally follow'd this curvature of the spine; and without doubt, the situation of the stomach and colon, which I have describ'd, had its origin in great measure from thence: and you easily under-

stand how much shorter and narrower the cavity of the thorax must be for that reason. For although the chest was much more convex than usual anteriorly, yet the situation of the left ribs took away much of its breadth; and the spine and the sternum, which represented the segment of a ring, as they were more curv'd, so much more did they bring the highest part of the diaphragm near to the upper borders of the thorax: and by this means, the heart, which was rather large, had the upper part of its basis not at a great distance from the neck. In the ventricles of the heart was a little coagulated blood; and the right auricle also contain'd a small polypous concretion. The lungs were connected here and there to the pleura forwards, by soft and thin membranes; but behind, the whole upper lobe was thus connected on one side. There was a kind of foam in the bronchia, which in some places was a little red, but in very small quantity: yet in other respects, the lungs, the asperia arteria, and the larynx, were sound.

The skull, which was thick, being taken away, and the sinusses of the dura mater being open'd, in that which is call'd the longitudinal, a small polypous concretion was seen; and in the lateral sinus, on the right side, the blood was very grumous and coagulated; with which also the small vessels were turgid, but especially those that ran in the pia mater, on the right and inferior side of the brain. Under this membrane, also, serum lay here and there, in the convolutions of the brain, so that you could easily separate it therefrom by the hand. But no serum at all flow'd from the tube of the spine, and but little was found in the lateral ventricles: and the paleness, not only of the vessels in the parietes of the ventricles, but of those which make up the choroid plexusses also, was a proof that this was not the first time of its irruption. Besides, in those plexusses were vesicles full of water. In other respects, however, the cerebrum and cerebellum were perfectly natural; and were so far from being flaccid in their substance, that they were even firm, but especially the cerebrum.

17. In so great a propinquity of the heart to the brain, and so great a difficulty in the descent of the blood, by reason of the inflexions of the aorta, it would not have been wonderful, especially in a young man given to drinking, if some blood-vessels had been ruptur'd within the cranium. It is less wonderful, therefore, that a distension of the vessels of the pia mater should be added to the water that was effus'd under it, and consequently encrease the constriction. But why so great a firmness of the brain did not resist the constriction thereof, or at least prevent the man from being kill'd in an instant of time, if you ask the cause, I think this might be it; that as the cortical substance of the brain is us'd to be less firm than the medullary, from which, as it offers itself in greater portions to the dissector, and is conglobated in itself, we for the most part judge of the firmness of the brain; the more firm in this young man the medullary part was, the greater was the constriction of the cortical, inasmuch as it lay compress'd between the more firm and medullary part, on one hand, and the water and blood distending the vessels, on the other. Or, whereas the cerebellum, for this very reason, because it consists chiefly of the cortical part, is wont to be less firm than the cerebrum, and in this youth certainly was; if the former rationale does not please you, imagine thus: that by how much the more the cerebrum by its firmness

resisted the compression, by so much the less could the cerebellum, which was weaker, resist it. For when, besides the bulk of the cerebrum, an unusual quantity of blood and serum were added, nor the parietes of the cranium, as they are bony, could at all yield; and the cerebrum itself, by reason of its great firmness, would not give way so much as in another man; it remain'd, that the greater impetus must be of course made on the cerebellum, from whence the most speedy death may happen: as I have shewn on a former occasion (r).

18. Nor would I have you be disturb'd, to find me now ascribing these effects to compression, whereas before I ascrib'd them to irritation and convulsion, consequent therefrom. For convulsion and compression both bring on the same effects of constriction. And we cannot doubt, when we consider the properties and weight of water, but that it must compress: as when we consider its acrimony, we cannot doubt but it will irritate and convulse. Wherefore the same water may frequently bring on compression, and convulsion: and by compressing, or convulsing, or both, may obstruct the blood in the smallest vessels, from whence the larger vessels will become turgid, and increase the compression. And in this manner you may conjecture the causes of a milder or a more grievous apoplexy, of a slower or more sudden death; either in this youth, where all these circumstances met together; for the rigid and contracted state of his arms, in some measure, was a proof of a convulsion; or in the man of whom I am just going to speak, where no marks of convulsion were observ'd.

19. An ostler, near sixty years of age, tall and fat, being us'd to eat much, and drink very freely, had been brought three times before into the hospital at Padua; once, on account of a fever, though not violent, and short; and again, on account of an apoplexy, of which he went out cur'd; and the third time, which was in the last summer, for an inflammation of his throat, at which time there were some pretty evident marks of an incontinency of urine. Finally, he was brought in the fourth time, for a second apoplexy, but one that by delay and negligence had been render'd incurable. For in the middle of December, the coldest season of that year, 1725, not having been observ'd the day before, he was found the day after in the corner of the stable, apoplectic and naked; lying in the blanket in which he had wrapp'd himself three days before. He was most paralytic in his right arm; he lifted up his head, and attempted to speak. Yet he could not be sav'd; for whether the water was made more acrid by stagnation, or whether you would rather suppose that its quantity being encreas'd by a new extravasation, a new paroxysm was brought on; or whether by urging its stimulus, or compression, still more and more, it brought him to his end. He died in the middle of the night, ten hours after he was thus found.

His body I examin'd diligently for some days, especially for the sake of the students who were about me, and found these things worthy of notice. The abdomen being open'd, the bladder of urine immediately presented itself; but the omentum it was necessary to seek for; as it lay entirely conceal'd betwixt the stomach, and the transverse turn of the colon. The sto-

mach was extremely contracted; which was wonderful in a man of this kind, even after so long an abstinence: nevertheless it was found, except that in the middle of its posterior and external surface, there was a roundish tubercle, though of the same colour with the stomach, which being cut into, seem'd to be made up of the same substance as most of the fibres of the stomach. Then turning our hands and eyes to the bladder, which having driven up the small intestines before it, extended itself quite to the navel; we found it cover'd with fat, and distended with urine, as we presently found the ureters and kidneys were also. These parts were likewise cover'd over with fat in like manner, and that in large quantity, hard, and adhering very closely thereto. Externally both of them had an unequal surface, nor were without marks of a former, as well as a present, ulcerous disorder; but internally, as their cavities were more enlarg'd, they were surrounded with the less substance about them: Was it because the urine, being often obstructed, had extenuated it by distension? or was it rather from erosion? which did not seem altogether improbable. All these things appear'd rather in the right kidney, which had a cell partly prominent outwards, and partly hollowed out from the substance of the kidney, full of a fluid like urine. In regard to the ureters also, though both of them were much enlarg'd, as I shall immediately explain; yet the left was a little less than the right. For this last, where it came out from the kidneys, had the bigness of a hen's egg cut off at the top; and in the other parts, almost wholly, did not a little exceed the trunk of the aorta, when nearest to the iliac arteries; except that, just at the insertion of it into the bladder, it was a little contracted; and in its extreme orifice scarcely admitted the point of the little finger. And so much longer was it made by its dilatation, that it exceeded thirty fingers breadth, when extended; for it often form'd angles by bending itself here and there; and at these angles it seem'd to be furnish'd with a kind of valves internally: but this appearance vanish'd when it was stretch'd out in a strait line. With the length and breadth of the coats, the thickness also had increas'd: so that it was easy for me to observe some things relative to their structure, of which it is not a proper place to speak here. Moreover, the coats of the bladder were thicken'd; and its fundus began, in some places, to be almost ulcerated. This circumstance, and the glans penis being naked, for the skin with which the glans us'd to be cover'd, was drawn back, almost as in a paraphimosis; and I know not what obstacle which occur'd near the extremity of the glans, when a probe was introduc'd, and the urethra soon after disjoint'd from the bodies of the penis, was immediately remov'd; made me open the urethra, and examine it diligently, beginning from the bladder, and going on to its orifice; but I found no mark of disorder, if you except some small white and oblong lines, which were a little prominent obliquely, before one side of the caput gallinaginis; and two other similar lines, which I found at about the distance of three fingers breadth, from the extremity of the meatus urinarius.

Taking off the sternum, the lungs were seen to be shrunk up on each side to the back, so as to leave a very fat mediastinum altogether uncover'd. The right lobe of them, on its lateral and posterior surface, coher'd closely with the pleura: as did also the whole surface of the heart, with the pericardium, and the surface of the right auricle; yet the right ventricle adher'd

more

more closely than the left. In both of these was contain'd black blood, which almost resembled tar; but that was much more like it which flow'd out in large quantity, and very black, from the vena cava, when it was cut into, close to the diaphragm. The carotid arteries, as they went up the neck, were very large. But the aorta itself, and whatever, either of vessels or viscera, I design'dly pass over, were natural in their appearance, as I am wont to hint by my silence; and the muscles were even well colour'd; and elegant in their texture, as well as in their colour.

Finally, I dissected the brain, on the seventh day after death. And I found the whole cerebrum to be endow'd with a remarkable hardness; whereas the cerebellum was but of a moderate firmness; and there was water within the cranium in a pretty large quantity. For besides that, I could with the greatest ease draw asunder the lamellæ of the cerebellum: in reality, water had flow'd out from the cranium, when it was divided from the neck, and when cut open with the saw: and there was still some water under the pia mater; and even no small quantity was found in the lateral ventricles, when I dissected the brain in its situation, as I generally do. For I am accusom'd to do this, not only more certainly to determine the natural situation of the parts, as I have already observ'd in the *Adversaria* (x); which others have since follow'd, and some before me had, as I imagine, pointed out, as they not only describ'd in their figures the brain taken out from the cranium, but also represented it dissected in its natural situation in the skull; but for this reason also; lest, when extravasated serum or fluid blood is in the ventricles, the brain being much handled and shaken, and the infundibulum broken through, they should either change their situation, or in great measure escape. I have even often determin'd, whenever I was permitted, to begin a dissection of that kind from the head, leaving the body perfectly sound; lest, when the jugular veins, or the superior cava, are cut through, blood, which was not concreted, should flow out from the sinusses: but it is not always permitted, or, for some other reasons, is not convenient, which was the case here. And therefore I did not greatly wonder, that all the sinusses, and all the receptacles about the sella equina, were empty. I found the vessels which ran through the pia mater, however, more turgid than was usual; yet it seem'd to be more from serum, and air, than from blood. But to return to the ventricles: in the duplicature of the septum lucidum I found a little water; and in the choroid plexusses, which were not of a pale or dilute colour, a great number of vesicles full of the same fluid. At length, having inverted the brain, I found both the posterior branches of the carotid arteries, which are, for the most part, very small, so exceedingly dilated; that if they had been naturally so, scarce Willis's delineation (x) of them would be blameable. Nor were the little branches, which go off from that artery with which the vertebals anastomose, less dilated in proportion, than the posterior carotids, with which they communicate. And besides, the left of those small branches in one part, and the left vertebral also near its anastomosis, was become white. For this reason I open'd both of these arteries, and on their internal surfaces I found a little white body, thickish,

(a) VI. Anim. 10.

(x) Cerebr. Anat. Fig. 1.

somewhat hard, and even almost cartilaginous; and it could not but happen that they must, in some measure, stop up the cavity, as they protuberated internally; for the external surface of the vessels was quite smooth, nor had any prominence; so that this disorder did not seem only to belong to the class of ossifications, but in some measure also, to that of internal excrescences in the vessels. Last of all, when I would have pull'd away the pituitary gland from its seat; a pellucid yellowish mucus issued from it, on the slightest compression: this mucus was not in small quantity, in proportion to the size of the gland, and was almost like what is found at the os uteri, except that it was not so tenacious: and you would have thought, that the greatest part of the gland had degenerated into mucus; for only a small and shapeless portion of it remain'd, and that, as far as I could judge by the sight, or by the touch, was natural: but the other part of the gland and its appendix were no where to be found. However, the infundibulum, which I had cut off a little before, as far as I could find by its external appearance, was just as it is in general.

20. The more prolix the history was, the shorter will the annotations be. As to the disorder of the kidneys, the ureters, the bladder, and the urethra, we shall take another occasion to treat of them (y). It is sufficient, at present, just to gather this one observation from them, which certainly relates to his death. It is probable, that the man had drunk much more than was usual, and that much less than usual had escap'd through the invisible foramina of the skin, by reason of the extreme coldness of the season; but the urinary passages and receptacles, in this sleeping, and afterwards apoplectic state, contracting themselves so much the less, as by reason of these disorders, they were the less sensible to stimulus, and had the less power of constriction, became thus distended with a great quantity of urine; nor was it drawn off by art, as well because the fatness of the abdomen conceal'd the tumour of the bladder, as because his known incontinency of urine did not suffer us to suspect it: for all these reasons I believe it happen'd, that when the parts, destin'd to receive the urine, were already so far distended as to admit of no farther collection, and the blood still abounded with the serum he had taken in, the remainder of it either rush'd suddenly on the brain, or was gradually extravasated there, and so put an end to the man's existence. But why the cerebrum should be particularly inundated, you may easily understand from the preceding apoplexy, as also from the vitiated state of the arteries going to that part, and perhaps even from the vitiated state of the pituitary gland: and what mischief may proceed from the one is already pointed out (z); and that which may proceed from the other, will be taken notice of below (a). Moreover, the cohesion of the right auricle of the heart with the pericardium, might easily prevent it from impelling the blood into the heart, so expeditiously as was intended by nature; for which reason it must flow back from the brain, as well as from other parts of the body, with less celerity and dispatch. But the cohesions of the auricle and heart with the pericardium, and of the right lobe of the lungs with the pleura, must be suppos'd to have had their origin from the inflammation of the tho-

(y) Epist. 42. n. 19. 20.

(z) Epist. 3. n. 22.

(a) n. 36.

rax, with which the patient had been afflicted the summer before. His pulse and respiration, at that time, were in the state they generally are in a disorder of that kind; but I could not learn any thing certain about them since that time.

Last of all, this circumstance is to be added to the history; that two years after, in the same month of December, his brother, who was also fat, was carried off by an apoplexy. And it was related to me, that his lungs were connected with the pleura, and that the aorta was in several places bony in the thorax: which I could easily believe; for I found the trunk of the same artery, in its whole tract through the belly, vitiated here and there, and become bony, when I dissected the organs which serve to the secretion of the semen and urine. In these organs, I observ'd the bladder of that size, and in part of that figure, which it naturally contracts, when it has been frequently distended with urine. The other parts, and especially those contain'd within the cranium, had been buried before these which I have spoken of were dissected. The disease of the aorta calls to my mind the history of another apoplectic person, in whom this artery was also diseas'd, though in a less degree.

21. N. Ferrarini, a priest of Verona, who had formerly been suppos'd consumptive at Venice, and had labour'd under a hemicrania ten years before at Padua, having now completed his forty-third year, the hair of his head was grey, and his face was sometimes too red; his habit of body was slender, yet not lean; and though he seem'd sprightly and joyful, he was very anxious with dissembled cares, and was very prone to anger. He us'd also to complain of pains within his thorax, the seat of which he pointed out, by laying his hand upon his sternum. And he had even said to his surgeon, the day before, that he was not well; and that he would therefore, as soon as possible, use all proper remedies at this convenient time of the year. This was in the very May in which Tita (*b*), and others (*c*), died suddenly in this city; although the season being become warm and dry, it was now the ninth day since this had happen'd to any one. Yet he supp'd cheerfully with his companions, but within bounds; nor, indeed, was he us'd to be at all irregular in his diet, whether you regard the quality or quantity thereof. Early on the following morning, however, he was found dead in a perfect sleeping posture, and lying supine, without any foam at his mouth; but his arms were so rigid, that they could not be drawn asunder without force: as I saw, when I came to his house before evening, with my colleagues, the primary professors of medicine.

The face, neck, back, and sides of the body were of a reddish colour, which frequently became livid. I order'd the skull to be first open'd. While that was doing, some blood flow'd out, almost of a dirty colour. The dura mater, at the sagittal suture, was black with blood, some quantity of which, but not polypous, was also found in the sinus of the falx. The vessels of the pia mater were distended with blood: as those also were which run on the sides of the lateral ventricles, and through the upper part of the plexus chorooides, which were in other respects pale. But the medullary substance of the brain was brown, as I should have suppos'd from the quantity of blood; and certainly sanguiferous vessels appear'd through its substance; if I had

(*b*) Epist. 3. n. 11.

(*c*) Ibid. n. 26. & Epist. 26. n. 35. Vid. ibid. & n. 17.

not seen in others a greater quantity of blood, and more sanguiferous vessels, and yet the medullary substance still white. In the ventricles was a pretty large quantity of water; and a good deal I also found in the tube of the cervical vertebræ. There seem'd to be no disorder in the cerebellum; nor yet in the brain, nor about the brain, any thing which related particularly to the hemicrania, wherewith he had been afflicted formerly, and which was perhaps external. There was nothing remarkable in the lungs, except a large quantity of blood. In the pericardium was almost no moisture. In the right ventricle of the heart ~~was~~ a polypous concretion, partly entangled in the fibrillæ of the valvulæ tricuspidæ, four or five inches long, an inch and half broad, and of a very compact structure; so that they who readily suppose polypi, might well have taken this for a polypus form'd before death. With this polypus was some black half-concreted blood, such as was also in the neighbouring auricle. In the left ventricle was blood in less quantity, and less coagulated. The columnæ of this cavity were in a manner inflam'd, and the femilunar valves rather harder than was natural. The trunk of the great artery, from the heart quite to the place where it begins to descend, had an unequal surface externally, as if it in some measure rose up here and there, after the manner of knots in a tree; but internally, in all that space, there was only a wrinkled surface, and two little obscure marks of a beginning ossification. But the aorta in the back, and all its ascending branches, were of their natural appearance.

The abdomen gave no testimony of disorder worthy to be taken notice of.

I gather'd, however, from the examination thereof, the time about which he died. For as the food was no longer in the stomach, nor any lacteals appear'd through the mesentery, it was easy from thence to conjecture, that he had not died long before he was found dead.

22. I judg'd that this priest was taken off by an apoplexy, as water was extravasated in the cranium; which by convulsing, as the state of the arms demonstrated, and at the same time by compressing, with the quantity of blood obstructed, had constring'd both the cerebrum and cerebellum. And that brown colour of the medullary substance confirms my opinion; for whatever it was, that, being deposited up and down between the fibres of the brain, had given a brown colour to the whole substance, as much space as it took up within the cranium, so much more dangerous did it make the constriction. I believe the disease of the aorta, in like manner, as I have said before (*d*), conspir'd to the formation of the apoplexy. For what you may possibly suspect of a syncope, is sufficiently invalidated by the appearances seen within the cranium, and by the lividness of the face, without adding any thing else. Nor suffer yourself to be easily impos'd upon by that polypous concretion; for that polypi, even more large and more compact than this, may be, and really have been, form'd after death, I will confirm in another place (*e*), in conjunction with that very eminent man Andrew Pasta, who ever since the time that he was my auditor, has been deservedly dear to me; nor will others, who attentively dissect bodies of every kind, disallow it. But this priest was wont to shew that he had pains in the thorax, by putting his

(*d*) Epist. 3. n. 22.

(*e*) Epist. 24.

right hand upon the sternum. I grant it; but disease was not wanting in that portion of the aorta, which lay opposite to the sternum, deep within the thorax: and that alacrity and promptitude to action, were sufficient proofs, that the right ventricle of the heart was not obstructed by this concretion, in the living body.

23. But as I find a great deal attributed to polypi by some, in the production of an apoplexy. I must not conceal what I have observ'd, and what seems reasonable to me, on this head. Polypous concretions have been also observ'd by ancient anatomists, and among these by Coiterus (*f*), who writes, that he "had drawn out from the sinusses of the dura mater of a woman, " who died of a phrenzy, thick fibres or filaments, not unlike worms, made " up of a white pituita, as he had at other times done from the brains of " persons who were hang'd; and that he had taken the same kind of concretions from the ventricles of the heart:" and thence he thinks the mistake arose of many people, who say that they had seen worms in the brain, and in the heart. But Nymmannus, when he had found concretions of that kind about the torcular herophili, imagin'd that this vein was obstructed thereby, from whence the blood was believ'd to be carried into the whole brain; and suppos'd an apoplexy to arise therefrom. You have the doctrine of Nymmannus in the Sepulchretum (*g*), so renew'd according to the laws of the circulation of the blood, that concretions of this kind, not about the torcular, but at the beginning of the internal jugular veins, are suppos'd to obstruct the blood, not as it is going into the brain, but as it is returning from it: and this is thought " frequently to happen in apoplectic persons." You will also read in the same place this addition; that if concretions of that kind, brought from the heart to the arteries, be by chance broken, from any violent commotion of the blood, and by the impetus be driven upwards, they must of consequence come to more narrow passages, that is, to the parts of the carotid and vertebral arteries, which will not yield, and so will of course stop up every way of access to the brain. And you will find, that what Fracafatus has mention'd, his having found in the bodies of apoplectic persons, dissected by order of the great duke of Tuscany, is in like manner not omitted (*h*); to wit, concretions in the sanguiferous vessels of the lungs, and the ventricles of the heart. But if we will allow the truth, Fracafatus (*i*) himself there confess'd, " that this disease was not to be call'd an " apoplexy nevertheless, but a syncope."

However, as for what relates to those two opinions spoken of, although it should be allow'd, that polypous concretions might certainly exist in the vessels of living bodies; yet it would not easily happen, that all the ways of ingress, or egress, to the blood, should be at the same time stopp'd up in the brain; unless almost the whole arterial or venal system, and the cavities of the heart, were fill'd with concreted blood: yet from hence a slow syncope would sooner happen, than a sudden apoplexy. Indeed, I have often found such concretions even in vessels going to the brain; but it has in fact so happen'd, that I have very seldom found them in apoplectic bodies, and

(*f*) Obs. Anat.

(*g*) L. 1. f. 2. obs. 1. cum schol.

(*h*) In additam. ad sect. cit. obs. 1.

(*i*) Dissert. de cerebro.

when I have met with them, they have been generally very small: and this the former, the present, and the following letters, will all sufficiently shew. So that I can by no means confirm, from my observations, that this is very frequent in apoplectic bodies; so far has it been from happening to me, as it happen'd to a certain person, of whom you will read in the *Sepulchretum* (*k*): I mean, that "how many bodies of apoplectic patients soever he open'd, in "every one of them he found those concretions, either in the heart, or in "the brain, or in both." You deny, therefore, you will say, the commentary of Martianus (*l*), "that Hippocrates thought a stagnation of the blood "might happen in the veins or arteries of the whole body; but in the apo- "plexy, that those were particularly obstructed, which are situated in the neck "and thorax." But I only deny, or rather only doubt of, what seems certain to many others after Martianus, and very frequent in the explication of that question which I spoke of above; although, as to the obstruction of vessels in the neck, how far this may contribute to that effect, must be estimated from the ancient experiments of Galen, which Salius also objects (*m*). But to compare those with what were made by Valsalva, would take up a longer disquisition than the present purpose allows; for which reason, it will be deferr'd to another occasion (*n*). I shall now subjoin other histories of the like kind.

24. A fishmonger, whose shop was at Venice, opposite to the gate of the public arsenal, of a middle age, a good habit of body, and rather fat, was never so chearful as usual since an illness which he had undergone some months before: yet he never made any complaint of his head, nor had the previous disorder at all affected that part. On the fourth of August, in the year 1708, without any evident previous cause, except perhaps from his food, in which even on the last days of his life he was irregular; his left cheek swell'd extremely, and the tumour extended itself from thence under his chin and his ear. Yet he was in his shop just as usual, and manag'd himself, as to his business and diet, just as before. But on the sixth of May, he had scarcely risen in the morning, after a good night's sleep, and put on his cloaths, when on a sudden he walk'd two or three times across his chamber, with amazing vehemence and haste; then immediately sat down; and being ask'd how he found himself, he answer'd, oh! oh! oh! and immediately expir'd on his seat.

The body was open'd by the celebrated Santorini before evening, while other physicians, and among them myself, look'd on. The limbs were somewhat rigid, the abdomen very fat, as were in like manner the omentum, mesentery, and mediastinum. Part of the small intestines was livid and variegated, to the length of a span, or more. The spleen was bigger and softer than it ought to be, and on its convex surface had some broad white spots. The hollow surface of the liver had here and there a kind of livid redness; its edge was entirely livid; and its whole substance resisted the knife much more than in its natural state. The cavity of the thorax was almost wholly

(*k*) Sect. cit. obs. 37. § 1.

(*l*) Annot. in Hippocr. l. 2. de morbis vers.

(*m*) De Affect. Particularib. c. 2.

(*n*) Epist. 19.

fill'd by the lungs, being very turgid, and heavy; but still less heavy than turgid: for they contain'd a great quantity of air, and not much serum: for which reason they were soft, and of a natural colour. In the pericardium was a moderate quantity of somewhat bloody serum. In the sinusses, auricles, and vessels of the heart, was no where any thing polypous: but we observ'd the blood to be quite fluid, as in both the ventricles, the pulmonary artery, and the aorta. And the diameter of the aorta, just above the heart, seem'd larger than natural. Before the skull was cut open, we enquir'd into the nature of the external swelling I have spoken of, and what was the internal seat of it. The parotid gland was itself found; only the membranes which envelop'd this and the neighbouring parts, but especially the adipose membranes, were turgid with serum, which had stagnated therein. And the blood itself stagnating, and, as it seem'd, almost extravasated, had stain'd the back part of the pharynx, and other internal parts of the neck. On seeing which, I beckon'd Santorini to take the pharynx, and the aspera arteria, with the larynx, and the other parts connected with them, quite out of the body; that we might examine them also. This being done, we found the membranes which cover the root of the tongue, the tonsils, and all the external surface of the pharynx, very turgid, with a tough yellowish serum: yet the tonsils themselves, and the canals which I have mention'd, were altogether natural internally. While he was taking them out, the internal jugular veins appear'd to be much distended with blood. In the mean while, the skull being open'd by the surgeon, the vessels, in like manner, of the cerebrum and cerebellum, which ran upon the surface, and those also that lie upon the corpus callosum, were found more turgid than usual, but the blood in them was fluid: and indeed no concreted blood was seen through the whole dissection. But serum was met with under the pia mater, which, for that reason, was easily drawn off from the brain; and a pretty large quantity was contain'd in the ventricles, and some flow'd out from the tube of the vertebræ. In the choroid plexusses were vesicles somewhat larger than are commonly seen. Yet they were not white, nor was the substance of the cerebrum or cerebellum flaccid, but of a proper firmness; for I examin'd it with my fingers.

25. If this man had not spoken at the instant of his death, nor had shown any struggles in respiration, I should have judg'd that he died rather of a suffocation than an apoplexy. During this dissection, the dissection of another man, as it generally happens, came into my mind; a dissection which I had perform'd at Bologna, three or four years before, and which was, in some measure, similar to this. At that dissection were present the celebrated Jacob Bartholomew Beccario, now professor at Bologna, and president of the academy of sciences there; and that very experienc'd physician Heraclito Manfredi, who assisted in the dissection, and who then discharg'd the office of assistant physician to the hospital of St. Mary de Morte, with great diligence and reputation. And I would have you understand, that these two excellent men were not only witnesses, but companions of my labours, whenever I say that histories were observ'd in that hospital: for it was our custom, at that time, to see the patients together, and to examine in con-

junction into the latent disorders after death, both from a desire of improving our studies, and from a mutual regard to each other.

26. A husbandman, of forty years of age, being affected with violent perturbations of mind, arising from a grievous misfortune, and at length being seiz'd, about the beginning of December, 1705, with a violent fever, was taken into the hospital I spoke of above. After some days, the heat and dryness of the tongue seem'd to remit. On the other hand, the arteries, which from the beginning had been soft, and of different force in different pulsations, mov'd still more unequally. On the sixteenth of December, in the morning, the pulse was worse, and lower. His eyes, which was also observ'd in the beginning, were intent, and fix'd. His thirst, in like manner, remain'd. Yet, except this, he complain'd of nothing at all. And even, upon being particularly ask'd, whether he had any internal heat, or any uneasiness in his head, chest, belly, or elsewhere, he said no: however, he just added, that his head seem'd a little heavy, and that in a slow, submissive, tone of voice, as he generally us'd; but he spake clearly and explicitly. It was not yet half an hour after he made this answer, when, as he was drinking some water, which he had drunk on former days, and was prescrib'd by the physician, his upper lip being drawn up, before the eyes of the attendants, he suddenly died. We ran to him upon the outcrie of those about him. The body being yet warm, we tried every part where there is generally a pulse, to see if any life remain'd, but in vain; for the man was entirely dead.

When I open'd the belly, on the day following, I observ'd a little more moisture in it than usual: and the omentum was so contracted, that it entirely lay hid under the angle of the left ribs. But the colon, where it forms its lower flexure, and joins with the rectum, was so prominent before the ileum, under which it generally lies, that in the middle it was almost contiguous to the bones of the pubes; and actually lay upon the bladder, which was full of urine. The external coats of the jejunum were sprinkled here and there with some red and almost livid spots; yet they were few and minute, and from them, when slightly wounded, some small drops of blood came forth. But the ileum was reddish, and a little hard in two places, under one of which (for I forgot to open the intestine in the other) was an ulcer, two inches wide, and three inches long, which having destroy'd the interior coat, had penetrated quite to the fleshy coat: yet the sinus was clean, and the lips were not tumid. On the edge of the liver was a lividness, yet it did not go far into the substance thereof. I pour'd out from the gall-bladder, which was of an unusual figure, thick and turbid bile, not much unlike the water in which fresh meat has been wash'd. The spleen was large and flaccid.

In the thorax, on each side, was some bloody water, such as was in the pericardium also. The lungs were found, except that there seem'd to be more moisture than usual in the bronchia; although they adher'd on one side to the pleura, and were black posteriorly on both sides: and this happen'd from the same cause, to which the immoderate redness, and blackness of the neck, back, and other parts, on which the body lay, was owing. For the blood was not coagulated, nor become grumous, but was universally fluid in the whole of this body: when the aorta was cut into, near the diaphragm,

phragm, it came forth fluid; and fluid did it come from the vessels of the neck, when the head was cut off: and from all the vessels, whencefoever we saw it flow. The blood was fluid, and without the least polypous concretion in the heart itself, which was very flaccid, and had all the valves belonging to the left ventricle here and there pretty hard, as they are wont to be before they become bony.

The brain was also very lax, and under the pia mater, in some places, were seen little bubbles, but every where a moisture. The lateral ventricles contain'd a little bloody water. Yet neither the vessels which run on their parietes, nor the plexus choroides, were pale. In the posterior part of the plexus on each side were vesicles, turgid with a pellucid fluid. Last of all, the pituitary gland was so low and contracted, that there scarcely seem'd to be any. After seeing these things, I had a mind that the larynx, and the parts about it, should be inspected; which I frequently do in cases and in bodies of this kind. But the teeth were so closely and strongly join'd together, that we could not draw them asunder, without the utmost force: whereas the other parts were by no means rigid, or contracted, nor, except the upper lip, which, as we said above, was drawn upwards when he died, did any other mark appear, which shew'd a distension of the nerves. The mouth, however, being at length open'd, the first thing that appear'd was a tumour, almost as big as a walnut, which occupy'd the right side of the palate, with the gum adjoining to it, where the dens molaris was much vitiated and destroy'd; and this tumour was turgid with pus, almost concocted. Moreover, the membrane with which the uvula, and the contiguous parts, and the external part of the larynx, even to the extreme point of the epiglottis, are cover'd, was livid on the surface; and being cut into, shew'd innumerable cells beneath it, the reddish and thin sides of which were distended with a kind of jelly. The parts beneath these cells appear'd sound; but the inner part of the larynx was ting'd with a reddish colour near the glottis; and the sides of the glottis, which, in other respects, were white as usual, were much more than usually collaps'd.

27. In this husbandman, you see the blood was every where fluid, as it was in the fishmonger: and in both of them you see how easily a collection of a pretty viscid kind of serum, in the cellular membranes, investing the larynx, and the neighbouring parts externally, was join'd with a tumour that arose at the side of the mouth. By reason of that collection about the larynx, a suspicion first arose, that the husbandman was suffocated as he was drinking. But what immediately remov'd this suspicion was, that no struggles, however ineffectual, were seen in him when he was dying, in order to expedite respiration. It remain'd, therefore, that I should rather believe he was suddenly stricken with an apoplexy, from convulsions. And the convulsion of his upper lip, but especially of his under jaw, was an indication of the latent one in the brain. Nor is it wonderful, that a man with a very flaccid heart, and with so lax a substance of brain, should thus suddenly perish: this laxity was before demonstrated by the stupor, in not being sensible to the stimulus of the urine, though the bladder was full, nor of the ulcerated ileum, nor the gum, and the tumour upon the roof of the mouth, nor even of the external membranes of the larynx being occupied by a congestion of ropy serum; though every one of these circumstances was so evident.

dent in the dead body. And you will not wonder, that a small quantity of fluid was able to bring on a convulsion, since you know, that a few drops of any fluid, so it be but acrid, resting upon a nerve, will bring on a great distension of the whole system. And you cannot avoid believing this water to have been acrid, inasmuch as from a fever of that kind, it fell suddenly on the brain, and its membranes, as on the parts which were weakest in this man. But if I had been so ready as Valsalva, at tasting certain humours found in the dissection of bodies; or if any thought had struck me while I was dissecting, of any other method, which was not altogether uncertain, of enquiring into its nature; I would also very willingly have communicated to you my discoveries on this head. However, since this is now out of my power, I hope you will receive in good part what I can at present communicate. For since, not only in these two, but in many others whose histories are describ'd in this letter (*o*), the blood was found fluid; consider whether you think proper, with Lancisi (*p*), in some of them at least, to acknowledge a redundance of acrid and irritating salts, from this consideration.

28. A woman of sixty years of age, who had been confin'd to her bed many years, by reason of a contraction of the muscles, that mov'd the lower limbs, and who was as well, certainly, as she had been on preceding days, having eaten rather more than she was us'd to do; gave a sudden turn to her eyes, and immediately died. The abdomen, thorax, and cranium being open'd, and examin'd by me, in the hospital for incurables at Bologna, in the year, as I remember, 1704; I observ'd nothing in either of those cavities, which could appear morbid, except water; and that was but in small quantity.

29. Although, in that contorsion of the eyes, a sign of convulsion was not wanting; yet if you would prefer compression in this case, or choose to have compression join'd with convulsion, you have my free consent. But perhaps you doubt here, and have doubted before, whether I do not impute too much to compression, from so small a quantity of water. For in the first place you are not ignorant, that many assert the constant existence of a small quantity of water in the ventricles of the brain, even in their most natural state. And you know very well besides, that there cannot possibly be a greater quantity, on any occasion, than in an internal hydrocephalus; and yet you know that Vesalius (*q*), who found in a girl, that had labour'd under this disorder, "almost nine pints of water," asserts, that the same patient "had enjoy'd all her senses perfectly till death, nor were her limbs and joints "paralytic, though they were weak indeed, and relax'd." To these things we may add, that tumours have been found within the cranium, which had been follow'd by no apoplexy, as you know extremely well, from a great number of dissections, and even from many that are to be met with in the Sepulchretum.

But to begin from these last, I have myself formerly observ'd in the Adversaria (*r*), that I had seen, in three bones of the cranium, an accretion of new bony substance, from which they protuberated much internally, and

(*o*) N. 2. 8. 9. 11.

(*q*) De corp. hum. fabr. l. 1. c. 5. Vid. &

(*p*) D. Subit. Mort. obs. Phys. Anat. 4. in Sepulchr. l. 1. S. 16. obs. 6. Schol. n. 4.

(*r*) VI. Animad. 84.

compress'd the brain; and yet that no disorder, much less an apoplexy, was generated thereby. But at the same time I inform'd my readers, that I believ'd no disorder was the consequence, because that compression had been made and encreas'd by degrees: and this is still my opinion, and I suppose will be yours; for there are innumerable examples, by which we may understand, that the bodies of animals will bear even the greatest changes with little or no detriment, so they are but gradually brought about; but that they cannot bear even those of a far less considerable nature, if they are made suddenly and at once. And suppose the same of the hydrocephalus, that I have said of tumours: for you know, that it always comes on by degrees; as that, of which Vesalius speaks, "was about seven months, more or less," in collecting; to say nothing of the yielding of the bones of the cranium, when this species of dropy begins. Last of all, though I confess that the ventricles of the brain are naturally moist, yet that in all bodies, and at all times, as much water is contain'd therein, as I have found in those apoplectic persons, where I spoke of a little only, I deny; because it is repugnant to a great number of observations, which I have made on other bodies.

And since this is the case, you need not doubt to acknowledge, a dangerous compression of the brain in those, who, having scarcely any water therein before, have it at once, or at least in a very short time, collected in a considerable quantity, especially if other causes are added to streighten and constringe the brain; which causes I have in part already describ'd, and shall in part subjoin, when I have given you the next history.

30. A rustic of the territory of Bologna, of more than sixty years of age, had for a long time past had filthy ulcers in his legs, which he eagerly desir'd should be heal'd. Therefore, although he was of a bad habit of body, for the most part, nor went to stool for six days, without taking purging medicines, or having glysters thrown up; yet having got a very officious surgeon, he brought the matter so far to a conclusion, that after three months, the ulcers, being cleans'd, began to heal. The cicatrix was not completed, when he began suddenly to complain of a very great weakness in his head; and, indeed, the pulsations of the arteries were very small and languid. The day after, the strength of his arteries return'd as usual, nor did he take food unwillingly. But, on the third day, he first began to be delirious, and presently to lose the sense of feeling in his whole body: however, he still stretch'd his arms out, when he was order'd, that his pulse might be felt. Signs of a distension of the nerves were observ'd soon afterwards in both arms: and at length, being depriv'd of all power of feeling and moving, and a steror coming on, he died; a small quantity of a yellow humour being discharg'd out of both nostrils after death.

I dissected this body in the beginning of the year 1705, Valsalva being present. The muscles of the abdomen were of a very good colour, were cover'd with a sufficient quantity of fat, and had also a proper quantity dispers'd among their fibres; and this fat was of a very good colour. But in the loins, at the sides of the spine, water was contain'd in the cellular membranes, instead of fat. The colon went from the right hypochondrium quite down below the navel, lying before all the small intestines; thence bending itself upwards again, it pass'd over to the right hypochondrium. Moreover,
the

the intestines, but especially the colon, and the other large intestines, were distended here and there with hard excrements. The liver was distinguish'd by very small spots of a tawny colour, variegated like marble, and had a kind of disagreeable smell. The gall-bladder was in a contracted state, and contain'd but little bile: yet the liver was not harder than usual, but a little larger. The spleen, however, was very large, and had a filthy appearance, being cover'd with large oblong spots, of a black colour, as if from inflammation; but this was externally, for internally its appearance was not bad. The vesiculæ seminales were also externally black. But on each of the testicles, within the tunica vaginalis, was plac'd a large hydatid, of which the left was the largest: they were in the middle of the bag, hanging almost loose, and free from all other parts. The fluid which was contain'd in them, being apply'd to the fire in a metal spoon, did not coagulate, but evaporated, leaving only a thin pellicle behind it. In the cavity of the thorax and abdomen was a little water contain'd.

Both lobes of the lungs had very considerable adhesions to the pleura: the right adher'd by its lower and posterior, and the left by its lateral and superior surface: and their adhesions were on both sides by a membranous texture of fibres. Nevertheless, they were entirely sound, as other parts also were; which I, therefore, as usual, pass by with silence. While I divided the cervical vertebræ from the thoracic, water flow'd out from their tube: and upon opening the skull, a thin fluid was found betwixt the two meninges, and in like manner between the pia mater and brain.

31. There are some things in this history, which do not come under consideration here, but shall be explain'd every one in its proper place; though I now give a detail of each circumstance, as I always do when I have it in my power, whether they relate to the present purpose or not: that the histories may not seem lame and imperfect, as they frequently are in the Sepulchretum.

If apoplexies from a serous cause were always brought on so slowly and gradually as this was, or as that which is describ'd by the celebrated Trew (s), in a man whom he dissected himself, and others of that kind; what Martianus (t) asserts would be altogether true, "that an apoplexy from an affluxion of cold humours, does not come on suddenly, as it happens in those of other kinds." But as the preceding letter (u) shews, that some of those, which took their rise from an effusion of blood in the brain, began mildly, and rag'd by degrees; so the present letter (x) gives you many examples of very sudden attacks from an effusion of water within the cranium: to which others might also be join'd, especially one describ'd by Brunnerus, and transferr'd into the Sepulchretum (y). And among those which have been observ'd since the publication thereof, with its Additamenta, that serous apoplexy (z) deserves notice, by which an old man, who was a soldier, without any complaint relating particularly thereto, having been in the country that day, and after supping as usual having gone to bed, was snatch'd away so suddenly, that his wife found him dead in the bed.

(s) Aët. Nat. Cur. t. 4. obs. 135. cum schol.

(t) Annot. in Hippoc. l. 2. de morb. vers.

64.

(u) N. 11, 20, 24.

(x) N. 4, 6, 9, 11, 16, 21, 26, 28.

(y) L. 1. f. 2. in Addit. obs. 11.

(z) Commerc. Litterar. a. 1741. hebdom. 44.

n. 1.

32. But the apoplexy last describ'd, which had evident marks of a convulsion join'd with it, must naturally be attributed to irritation and acrimony; the water contain'd within the cranium being, doubtless, impregnated with the erosive particles, which were us'd to be discharg'd by the ulcers; as we have already shewn in similar histories, both from Valsalva's papers, and mine. Yet, let us suppose that it happen'd from this little quantity of water, and that the water could not injure except by its compression; and even then I think we may easily conceive, how a great compression may be brought on by a little quantity of water. For what would be but a small quantity to some, may be a large quantity to others; to those, for instance, who have less space within the skull by nature, or from any preceding or acceding cause, even at the time when the water is extravasated or encreas'd. But do not imagine, that among the causes of other kinds, which may possibly happen, I certainly reckon what Piccolhominus (*a*) does not hesitate to lay down as certain, "that at the full-moon the brain is so turgid with moisture, that it fills the whole cavity of the cranium." For in regard to this matter, though by reason of the observation of Fallopius (*b*), we should not hastily reject it, yet there does not seem to be any thing in it; whereas, on the contrary, I think the same circumstance may happen from blood, from whatever cause, distending all the vessels in a very great degree, as I have explain'd above (*c*). And if to this distension of the vessels, be by chance added an encreas'd force of the arteries, which by their stroke and dilatation alternately raise up the brain; the more you shall suppose this force to be encreas'd, the more must you conceive that the space within the cranium is diminish'd: and whether the vessels are distended at the time of the extravasation of the water, or long before, the case is exactly the same. So in the soldier, who, though he went well to bed, was yet found dead therein by his wife, as I related before (*d*), vessels were seen through the surface of the brain turgid with blood; but when he went to bed, he does not seem to have had either turgid vessels, or extravasated water. And in a certain crooked mountebank (*e*), the vessels which compose the choroid plexusses, being chang'd into a hardish tumid body, of a fleshy colour, which change could not have happen'd in a short time, sufficiently shew'd, that the sudden death of this man did not arise from the tumour only; for then it must have happen'd long before; but also from the effusion of much limpid water, which, as it found the space within the cranium already diminish'd by this tumid body, could so much the sooner occupy the space that remain'd; and thus by entirely compressing the brain, put an instant stop to existence. But all these, and other causes of this kind, belong to the latter of those two classes, which I mention'd above. For the causes of the first class, or those which render the space narrower at all times, in some men, as they exist from the birth, or from infancy at least, must be accounted for from the bulk of the cerebrum, or cerebellum, being disproportion'd to the cavity of the cranium; or, on the other hand, from the capacity of the cranium being disproportion'd to the bulk of the brain. And as this want of symmetry frequently happens betwixt other parts, why may it not

(*a*) Anat. Prælect. l. 5. lect. 1.

(*b*) Traët. de Vuln. c. 12. (*c*) N. 14.

(*d*) N. 31.

(*e*) Commerc. Litterar. a. 1736. hebdom. 46.

sometimes happen betwixt these also? Indeed, when I first made mention in the *Adversaria* (*f*) of the different capacity in the skulls of different persons, in order to illustrate the subject now in question; I was led to it, if you ask me, by observing it so different in different persons, and by observing in some how very deep a hollow was form'd for the vessels that are prominent in the dura mater. But the very sagacious Hunauld (*g*) has evidently confirm'd the tacit cause of my conjecture, and enlarg'd upon it; who, I find by letters that I receiv'd from my very benevolent friend, the celebrated Reaumur, while I wrote these letters, is prematurely snatch'd from the Royal Academy of Sciences at Paris, and from me. For Hunauld has observ'd, that sometimes in the skulls even of boys, the coronal and sagittal futures are prematurely clos'd and cemented together; and that the bones, for this reason, not giving way, the growing brain is so confin'd and press'd, that in a boy where these futures were entirely obliterated, the bones were much more hollow'd out, both in the forehead and sinciput, to receive the convolutions of the brain. And since these things are so, you very well see what causes may exist at all times in some persons, or may occasionally happen in others, which by taking up the space, may render that water, which would be very far from doing injury in those persons where other causes do not exist, so extremely noxious, that by its sudden or speedy effusion it may cause compression and apoplexy; and that even sooner, perhaps, than an equal quantity of blood extravasated within the skulls of those persons, who had a larger capacity of space.

I do not, however, forget, that there are many very learned men, who do not chuse to acknowledge any vacuity, or space, in the great cavities of the body; but suppose so great a plenitude in all, that nothing more can be added thereto. But this is not the place to treat fully and accurately of such a question, or to consider whether it is necessary to suppose the cranium entirely full, when the continued appendix of that cavity, I mean the tube of the vertebræ, is not every where full of the spinal marrow, which is the appendix of the brain: for you know very well, that the spinal marrow is, through a considerable tract especially, so attenuated, that it cannot come in contact with the dura mater. Nor will I here enquire, whether the corpus callosum, which is not convex on its internal surface, where it forms the roof of the lateral ventricles, lies in such a manner on the corpora striata, and the thalami nervorum opticozum, by the protuberance of which not only the basis, but the sides of the ventricles are form'd (*b*), so as to leave no interval at all betwixt them: nor yet, whether any space at all be left betwixt the sides of the fourth ventricle, that are so prominent; or betwixt the hollow surfaces of the anterior and posterior part of the same ventricle; or in the canal, which is call'd the passage to the fourth ventricle: and finally, whether there be any cavity, by which moisture can penetrate from the ventricles to the infundibulum, and the pituitary gland; both of which parts otherwise might seem to be created in vain. But I omit enquiring after these things here, since that may be sufficient at present, which they themselves expressly confess; I mean, that the brain "has cavities, so that it may sometimes be relax'd, when

(*f*) VI. Animad. 84.

(*g*) Hist. de l'Acad. R. des Sc. a 1734.

(*b*) Advers. indic. animad. 10.

“ these cavities are empty, and may sometimes be compress’d, when these cavities are full :” and in another place, “ that no arteries are more dilatable than those which are contain’d in the cranium, but that they are confin’d and streighten’d thereby. When, therefore, the arteries of the pia mater are fill’d with a greater quantity of blood, they take up a greater quantity of space, and that space is taken away from the other parts of the brain. Hence sleep is brought on by drinking spirituous liquors.” I do not doubt, therefore, but that space which they acknowledge, and which they say can be mutually diminish’d and restor’d, without exceeding the bounds of nature, is different in different bodies, as it happens in other things; and in those, consequently, where the space is rather larger than in others, there, from the same quantity of water, neither the same compression of the brain, nor the same injury will happen, as in those where the capacity of the cranium is more confin’d.

33. But perhaps you are in the number of those, who would never suppose water to be the cause of an apoplexy, but only the effect of the same cause which produces the apoplexy; for instance, of blood obstructed in the vessels, which are in and about the brain. And I have so far assented to the opinion of these learned men, in my first letter to you (*i*), and still farther in the *Adversaria* (*k*), yet without making any greater concession than is sufficient for other very wise men; I mean, that the case is “ for the most part” as they suppose it. I have done, therefore, in this letter, perhaps, which I now send you, what less inconsiderate men are us’d to do in courts and processes at law; who, that they may obtain from their adversaries what is just and right, ask sometimes for a little more than is just. For it is sufficient to my purpose, that water, by convulsing, or compressing, or by doing both together, may sometimes be the cause of an apoplexy. As you are quite at liberty to use your own judgment, which I permitted you from the beginning (*l*), if you do not think proper, in all the histories that I have produc’d, to attribute so much effect to the water as I have seem’d to attribute, do not, however, refuse to do it in some; and at least attend to the reasons, by which I have endeavour’d to shew, that either the water actually was, or certainly might have been, the cause of the disorder. But if it should happen, that I seem to have prov’d nothing at all by those reasons, and you chuse, at all events, that the water should rather be the effect than the cause of the disorder; take care, lest your own reasoning compel you, though unwillingly, to confess, that the extravasation of blood must also be the effect, and not the cause, of apoplexies. They who have imagin’d this, do not seem sufficiently to have attended to those circumstances; that extravasations of blood do not always depend upon the rupture of distended vessels, nor rupture upon the present remora of the blood; for the coats of the vessels may be pierc’d through by erosion also, as I have said before (*m*); or after they have been much attenuated by foregoing and repeated distensions, or impetus of the blood, may be altogether broken through by any sudden, though slight, impulse that is given them. But do the apoplexies, which are the consequents of extrava-

(*i*) N. 5.(*k*) *Advers. indic. Adimad.* 84.(*l*) N. 1.(*m*) *Epist.* 3. n. 3.

fated blood, owe their origin to the blood obstructed in the vessels, or to that which compresses the brain on the outside of the vessels? Certainly, what a compression of the brain alone can bring about, we have known demonstrated both by art, and by chance, as well in men as in brutes; where, by accident, a pretty large part of the skull has been taken away: for by laying the hand upon the brain, and pressing it, the same symptoms came on which attended an apoplexy; and by taking away the hand, they, gradually, vanish'd. And that we may not give up, in the least, that compression which is made from extravasated blood; call to mind what the surgeons frequently see, or rather read it in the *Sepulchretum* (*n*). "That compression alone, from blood stagnating in the space betwixt the two meninges, is sufficient to bring on an apoplexy, they abundantly prove, who being depriv'd of all sense and motion, are deliver'd from instant death by the trepan alone." From which examples you may also gather, wherewith to reply to those who acknowledge, that an apoplexy arises from compression indeed; but from that compression only which urges the brain, not in one particular part, but almost on all sides. And anatomical examples also militate against this doctrine, as those two which are mention'd by the celebrated Van Swieten (*o*). For it is evident, that blood extravasated, to the quantity of two spoonfuls, or even of one spoonful only, can by no means compress the brain on all sides. And if to those two, you add that which I have given you in the last letter (*p*); you will understand, that two spoonfuls of blood, pressing only a part, and that an external part of the brain, may bring on an apoplexy. And in what manner a little blood may bring on a great compression, you will know from the arguments I made use of above (*q*).

34. If, therefore, extravasated blood, by compressing the brain, causes an apoplexy; in like manner extravasated water, in a given proportion, may do the same; or at least, when join'd to some other cause, which alone could not effect it. So that if by chance, to blood, not yet so obstructed in the vessels, as to be able to bring on an apoplexy, an extravasation of water, in the mean time, be added, this effusion will be, if you will have it so, the effect of that remora; but the compression, which will be added, from the extravasated fluid, will be the ultimate cause of the apoplexy.

But although I plead liberally with you in this dispute; yet, that you may not imagine I am perhaps more inclin'd to the other side of the question, the merits of which I have not yet examin'd, and have therefore, right or wrong, attributed such surprizing effects to water, I will last of all give you a history of a man, in whom much water was found within the cranium, although he had no apoplexy; and will omit partly, and partly defer to another occasion, other histories of apoplectic persons, in whose skulls this fluid was found. And when I have finish'd this history, and added a few things concerning one manner in particular, among the rest, by which water is collected in the brain, I will give the finishing stroke to this prolix letter.

35. An old man, near fourscore years of age, who had been formerly troubled with ulcers in his legs, as the scars evidently shew'd, and had his

(*n*) l. 1. S. 2. obs. 9, in Schol.

(*o*) Com. in Boerh. Aph. § 1010. s. & 4.

(*p*) n. 14.

(*q*) n. 32.

skin, at that time, almost cover'd with filthy pustules, was taken 'in about the evening to the hospital of St. Mary de Morte at Bologna. His pulse was not quick, but weak and unequal; nor was it so sensible in one arm as in the other. His eyes glister'd, and were fix'd, but seem'd to look at different objects. Being ask'd if his head was painful, or heavy, or drowsy, he answer'd no. But he said that he had vomited; and this he seem'd to say with a faultering tongue, and a hesitation of speech. Yet sense, feeling, and motion remain'd. In the night his disorder encreas'd; and the next morning he died.

The abdomen being open'd, every thing appear'd sound, except that the viscera were much moister than usual, the liver whitish, and somewhat hard, and its bladder fill'd with a blackish bile: and finally the colon, if you suppose that to relate to the present case, was contracted to the thickness of a finger, below the stomach. It was then eleven hours since his death, and the body had lain in the open air, which was cold; for it was the middle of December, A. 1705, yet the intestines were still warm. The lungs were on all sides connected with the pleura, and while I separated them with my hand, in the left side, some water issued forth; but whence it proceeded, or where it stagnated, I could not certainly tell. In the heart, as in the other parts also, the blood was fluid. When the head was cut off, water distill'd from the great foramen of the cranium; and indeed a fluid was every where within the skull, but especially under the whole pia mater, through which it shone like frothy saliva, having bubbles mix'd with it here and there. The plexus choroides had some vesicles upon them distended with water; yet they themselves were not become white, from the water which was found in the ventricles. The brain was very lax; and the pituitary gland was almost annihilated.

36. Whether there was a larger space in this skull, in proportion to the bulk of the brain; or whether the vessels of the brain (which I could neither observe to be turgid, nor had the pulsation of the arteries indicated it) were not at all over-loaded, or the water had been collected slowly, and by degrees; be these things as they will, there was, you see, no apoplexy in this man, and yet much water in the cranium. But I could more easily have determin'd, in what manner it was collected, if, instead of a pretty large quantity of water in the ventricles particularly, there had been a still much greater quantity, and the plexusses had been discolour'd. For when I saw the pituitary gland so greatly extenuated, I could not help suspecting, that it had not fully perform'd its functions; just as we see the mammary glands, the thymus, and the testes, so much the more contracted, as they have the longer ceas'd from their offices. But if the office of this gland is to receive the moisture that distils from the ventricles, by the infundibulum, why was there not a greater quantity of water in the ventricles, and marks of longer maceration, if I may so speak, in the plexusses? Nor were these marks, nor yet the very large quantity of water, found in the husbandman, nor in the ostler, who are spoken of above (r); though, in the first, the gland was contracted, as much as in this old man, and in the ostler was almost destroy'd. How is

it then? Is the use of this gland, which is so commonly taught us, to be call'd into question? or rather, because this office is not obscurely argu'd, from the very structure and situation of the parts, must we explain it in a particular manner, so as to suppose that the diseases we observ'd in this gland, might obstruct the defluxion of moisture from the ventricles, but not so much as it seem'd to us that they naturally should? As for instance, if there are passages beside the infundibulum, whether such as some have imagin'd, or of any other kind whatever, less manifest indeed, but in greater number, through which part of the moisture may be dispatch'd from the ventricles. For by these means, unless these passages be at the same time obstructed, the ventricles will not be fill'd; and if they are, a great dropy of the brain will be the consequence. Therefore, as I suppose they were stopp'd up, in that hydrocephalus, where Hunauld (*s*) found no sensible disorder, either in the infundibulum, or pituitary gland; so I should believe they were obstructed, in like manner, in another hydrocephalus, in which "no traces of the pituitary gland remain'd," as you read in the Sepulchretum (*t*); and still more in another, which you read of in the same place (*u*), in which the gland was "flaccid, and very large," nor much less in a third, and a fourth in like manner, there describ'd (*x*), or mention'd: in one of which, there was contain'd in the gland "an unctuous humour, adhering to the probe like bird-lime, yet transparent;" and in the other, "where the infundibulum was inserted into that gland, it was entirely fill'd with a viscid kind of jelly, to the bigness of a small bean." In all these, therefore, I believe, that the other passages were obstructed; but not in the three apoplectic persons whom I have spoken of above; nor yet in him whose case is describ'd in the Sepulchretum (*y*), in whom "the pituitary gland, that was twice as big as usual, was found to have a sinus fill'd with mucus, which was concreted into a yellowish and transparent jelly." For in these I ascribe no more to the gland than "its contributing, in some measure, to the accumulation of water," which was also the opinion of Wepfer (*z*), the author of this last observation, in that part of the Scholia, which, as well as his name, is omitted in the Sepulchretum. And if you join this observation, as well as those two of the hydrocephalus, that I last pointed out, with the history of the oster (*a*), as far as it relates to the disease of the pituitary gland, you will readily understand, that among other of its disorders, a congection of viscid mucus therein does not very rarely happen; and to this cause, perhaps, we must refer that tumour of the steatomatous kind, found in this gland in the year 1707, by the same Manfredi whom I commended above (*b*). And that the other passages may also be sometimes stopp'd up, you will conceive, if, when you read in the Sepulchretum (*c*), the description given by Pechlinus, of a dissection of a hydrocephalus, you observe, that under a great quantity of limpid serum, "there was in the bottom of the ventricles

(*s*) Mem. de l'Acad. R. des Sc. A. 1740.

(*t*) l. 1. S. 16. obs. 7.

(*u*) Obs. 8. vide tamen de utraque hac observatione Epist. 12. n. 4.

(*x*) Cit. Sect. 16. in Addit. obs. 12. & in Schol. ad candelam in fine.

(*y*) l. 1. S. 2. obs. 41.

(*z*) Obs. ex cadav. Apopl. in Aust. Hist. 16.

(*a*) Supra n. 19.

(*b*) n. 25.

(*c*) In cit. Addit. ad Sect. 16. obs. 5.

“a ropy and pituitous lymph, which had applied itself, like glue, to the sides of the medullary substance of the brain, and the edges of the ventricles.”

37. An occlusion of the infundibulum, however, hinders the defluxion of moisture, from all the ventricles of the brain, into the pituitary gland, as that did which Brunnerus gives the relation of (*d*); and in like manner, those which LITTLE (*e*), and others, amongst whom is the celebrated Haller (*f*), have given instances of from their own knowledge. But how far a coalition of the borders of the fornix with the basis of the lateral ventricles, or a very close compression of these parts to one another, can hinder a defluxion from those cavities, remains yet to be enquir'd. But at length I will conclude this letter, as I promis'd you. Farewel.

LETTER the FIFTH.

Which treats of the Apoplexy, as arising neither from a Sanguineous nor a Serous Cause.

1. **T**HE apoplexy, as Boerhaave (*a*), according to custom, excellently says, “is properly divided into the sanguineous and pituitous; but the division is by no means perfect, since there are also apoplexies from serum, from atrabilis, from polypi, and from other causes.” And I am also of the same opinion with him, some little points excepted, who have in like manner, taken my notions of this disorder “from the anatomical inspection of bodies that died of this disease.” Therefore, when I divided apoplexies into sanguineous and serous (*b*), I did not divide the disease itself, but rather the more frequent dissections of apoplectic bodies, which had happen'd to others, but especially to Valsalva and me: at the same time ingenuously confessing, that other causes of apoplexies, beside blood and serum, were frequently found, some of which I will now propose in this letter, as I at that time promis'd you. And I us'd the distinction of serous, in opposition to sanguineous, rather than pituitous, because I consider'd it as the more frequent. For though I do not doubt the veracity of Columbus (*c*), when he says, “that he had more than once dissected those who died of a violent apoplexy; and that, in their brain, he had found a great quantity of water; but transparent and glutinous;” yet I believe he saw what was less frequently to be met with; unless you, perhaps, can suppose, that he attended rather to the appearance, than the real nature, of that fluid, under

(*d*) Ibid. obs. 12.

(*e*) Mem. de l'Acad. R. des Sc. A. 1707.

(*f*) Icon. Anat. Fascicul. 7. in Explic. Tab. 1. ad P. not. C.

(*a*) Aphor. de cognosc. morb. § 1012.

(*b*) Epist. 2. n. 6.

(*c*) De Re Anat. l. 15.

the pia mater (*d*); which, at first sight, appears like a jelly. But if he did really find a fluid of a pituitous nature, which was at that time commonly believ'd to be the cause of apoplexies, he did right to insert his observations of that kind, in a book which he entitl'd, *De iis que raro in anatome repèriuntur*. Nor was Varolius (*e*) less in the right, (whose passage, though also quoted before (*f*), it is perhaps more just to interpret after this manner) if with a view to the same pituita, he denied, "that a greater quantity of recre-
"mentitious matter was found in the ventricles of the brain of apoplectic
"persons, than is generally found in others." But let me go on to fulfil my promise, beginning with two histories from Valsalva.

2. A man, of three-and-thirty years of age, of a sanguineous temperament, slender, and afflicted with a rupture, was much given to the use of wine and tobacco. This man began to have a pain in the left part of his head, especially at the occiput; which was follow'd by a pain and weakness of the muscles of the neck, on the same side. At first there was a violent fever; but it afterwards seem'd to remit; and his pulse not only became slow, but weak also, and had little power of resistance: at the same time his strength began to decay; so that every motion of the body was difficult. Moreover, after an interrupted delirium, an aphonia came on, nor could the patient move himself any more; but dying thus in a very slow manner, at length, after the fourteenth day, was no more.

While the brain was taken out of the cranium, a little purulent matter was observ'd on its basis. This being wip'd away, while the brain was handled, fresh matter was seen in the same place: that is to say, it had come out from the ventricles, through the infundibulum; and both the ventricles, but especially the right, overflow'd with it. For in the corpus striatum of this ventricle was a foramen, which communicated with a sinuous ulcer, that occupied a third part of the substance which compos'd the basis of the brain on the right side. The brain was not vitiated on the left side. Having inspected these things, we dissected the scrotum on account of the hernia, and found the intestines so closely adhering to the testicle, and its involving membranes, that they could by no means be replac'd.

3. If extravasated blood were converted into pus, you would perhaps think, from comparing this with other dissections describ'd in the third letter (*g*), that this case also was an apoplexy arising from extravasated blood, which had first hollow'd out for itself that cavern in the brain; and presently being turn'd into pus, had broken through the corpus striatum, and rush'd into the ventricle which lay over it, and so into the other. But as other histories already produc'd, and to be produc'd on future occasions (*b*), will sufficiently prove, that blood really continues in its original form, and does not become pus; it is better to conjecture, that an abscess being by degrees form'd in the brain, a violent fever was excited, at the same time when its matter was converted into pus; which being done, the fever, according to custom, remitted (*i*); but that presently this pus, having made its way through

(*d*) Vid. Epist. 6. n. 12, 13.

(*e*) De nerv. optic. Epist. 2.

(*f*) Epist. 2. n. 7. & epist. 4. n. 1.

(*g*) Vid. præsertim n. 4.

(*b*) Epist. Anat. 13. n. 23. & Epist. Anat.

Med. 2. n. 15.

(*i*) Hippoc. f. 2. aph. 47.

the corpus striatum, and overflow'd into the ventricles, that disorder of the apoplectic kind was brought on. There is an observation of Laubius (&) extant, which I shall probably take notice of in another place, that might be compar'd with this, if the seat of the abscess was more clearly pointed out; although an apoplexy from pus succeeded a violent fever after a much longer time. For it appears, that the pus flow'd out from the left hemisphere of the brain, above the os petrosum; but I do not so well understand, where "towards the thalami," (both the thalami, doubtless, as these words always signify, not to speak of the preceding affection of both eyes) I say, where the pus was "before shut up towards the thalami nervorum opticorum." Yet the source of that pus, which was seen by Valsalva in another dissection, was still more obscure; and this also happen'd in a patient, who died, if not of a true apoplexy, at least of a disorder of that kind. The history is as follows:

4. A woman, more than forty years of age, after having her monthly evacuations greatly diminish'd, was attack'd with a cancerous tumour in her left leg; which being afterwards ulcerated, and other ulcers also beginning in the same leg, considerable pain, and almost continual fever, came on. She had now borne it a year and more, when quite tir'd of her continual pains and uneasiness, she begg'd of Valsalva that he would amputate the leg, which was now incurable by any method whatever. Valsalva consented, and perform'd the operation with success; but when it came to the third day, a livid colour appear'd in the stump, which continuing two days, a plaster of emollients and volatiles was applied, and the lively colour was restor'd to the part. In the mean while, the fever became every day more violent, and degenerated into an acute one. The right parotid gland was so much swol'n and enlarg'd, that for more than twenty-four hours she could not swallow even liquid aliment. But profuse sweats coming on, the fever remitted, the swelling of the parotid was discuss'd, and every thing seem'd to proceed very well. Moreover, when about the thirtieth day, by reason of some error in diet, the acute fever had return'd, and lasted some days, it was again carried off by sweats. Notwithstanding these circumstances, the cure of the wound was not prevented going on, till at length the cicatrix being almost completed, a perfect cure seem'd at hand. But about the third month after the amputation, when the patient was taken out of bed, she was seiz'd with a disorder of the apoplectic kind. For a diminution of feeling and motion, in the whole right side of the body, was join'd with delirium and convulsions: which disorders, though they seem'd to remit for some days, yet return'd more violently, and carried off the patient. The skull being open'd, a large quantity of pus was found stagnating in the left ventricle of the brain; but no injury was found in the brain itself: yet it might be suspected, that the matter, which had been before carried into the leg, was now carried into the brain.

5. This suspicion, however, has a very difficult and obscure explication: for the matter, which had been before carried into the leg, was made pus in the ulcers of the leg, but in the brain no ulcer was any where found. Or if we suppose that part of the purulent matter was carried back into the blood,

(*) Eph. N. C. cent. 7. obs. 39.

why did not this flow rather to the wound, which was not yet perfectly heal'd? I should rather chuse to suspect, that at the time of the acute fevers, matter was collected in some internal part of the body, and an abscess was form'd; if Valsalva himself, who was so diligent in his attendance on the woman, and so studious to enquire into all her complaints, and their causes, had not more than sufficiently prov'd, that no such thing had ever happen'd, by thinking that it was not necessary to dissect any other part of the body but the head. What then? Shall we believe that it was rather a pus like humour, than a true pus? The great skill of Valsalva in chirurgical matters does not suffer us to believe this, as he expressly says, that he found pus in the ventricle. It is better therefore to wait till light is thrown on it by some other history, than to give out any rash or hasty decision. In the mean while, I shall go on to describe to you some of my own histories; the two first of which seem, in some measure, to answer to those two of Valsalva just now related.

6. A woman of Padua, by name Jacoba, the wife of Angelo Zanardi, (for by reason of finding thirteen ribs on each side of her, I enquir'd out her name, and noted it down, which I am not us'd to do among the common people) being in the fifty ninth year of her age, was seiz'd with an apoplexy. To this a violent fever succeeded. And on these accounts being brought into the hospital, she continued to live some days. Although she could not speak, yet she seem'd to understand on the first day; for she gave of her own accord the sound arm to the physicians, to have her pulse felt. The sound arm was the left; for the right limbs had neither feeling nor motion, and moreover, seem'd to be in some measure contracted from convulsion. So the eye-lids of the right eye were paralytic, and almost clos'd. Her face was red. She had no difficulty in swallowing fluids.

When I heard that the woman was dead, and heard this relation of her, I so much the more willingly undertook the dissection of the body, for the sake of the students; because, if the injury in the brain was organical, they hop'd they should certainly see it on the left side, according to the observations of Valsalva, confirm'd in an epistle (*1*), at that time lately publish'd by me. They attended this dissection, therefore, in great crowds, together with many learned men, and others; for the dissection was accurately perform'd, and lasted many days. However, I shall speak of nothing here but what was found to be præternatural, or unusual.

First of all, I observ'd the unequal nutrition of the body, which was in other respects of a proper stature. For the trunk and thighs were fat; but the feet and legs, and particularly the upper limbs, were slender and lean. It was thirteen hours after death, when the abdomen was open'd; and though the weather was cold, for it was in the last days of the year 1740, yet the smoaking viscera retain'd a smart warmth even then, and an hour after. The omentum was drawn up to the stomach, which appear'd small; whereas the small intestines, and part of the large ones, were somewhat turgid with air. The intestines had also been carried up by the bladder, which being distended with urine, and having no covering but its own fat, rais'd itself six inches above the os pubis. On compressing the bladder with my hand, a high-

(1) Epist. Anat. 13.

colour'd lixivious urine, but not fœtid, came forth with difficulty, and by drops; for the sanguiferous vessels, at the upper orifice of the urethra, and some space above it, were very much distended with blood, and blackish; and in like manner, those which ran through the internal surface of the urethra, though not in quite so great a degree: and from thence you will naturally imagine, that these parts had not been merely inflam'd, but even were on the point of mortification. Moreover, the internal surface of the bladder was distinguish'd here and there with bloody points. In the cavity of the uterus we observ'd somewhat of a yellowish humour. Nor was there any thing more to observe of the viscera, in the abdomen, except that the gall-bladder was very turgid with a brown bile, as it seem'd to the eye, but which stain'd with a high yellow; and with this intestine the colon, where it lay nearest to the gall-bladder, was colour'd. In that bile were some few concretions, all small and soft, except one, which was compacted into a firm hard calculus, and equal in diameter to the point of your little finger. The figure of it was round, and its surface every where granulated; so that except its colour, which was cineritious, and its having somewhat transparent in it, it might very easily have been taken for one of that sort of sweet-meats commonly call'd fugar-plumbs, which are made of coriander-seeds, cover'd over with fugar, so as to have a rough surface.

In the thorax, the right lobe of the lungs was in great measure connected to the pleura; and the upper part of it, posteriorly, so corrupted, perhaps from an old disorder, that it discharg'd a very ill-smelling humour. This being wip'd away, and the viscera taken out, both from thence and from the abdomen, I observ'd and demonstrated two things; the one in the diaphragm, and the other in the ribs and vertebræ: which, though they have no reference to the present disorder, are nevertheless worthy to be related, on account of their extraordinary nature. In the diaphragm were two foramina, very near to each other, but quite distinct; which gave passage to veins from the belly to the chest. For besides the larger foramen, which is always to be found, and serves to transmit the trunk of the vena cava itself, another also appear'd near the anterior border of the first, carrying through it one of the hepatic veins, to be insert'd a little higher than usual, that is, above the diaphragm, into the trunk of vena cava: and the ribs were six and-twenty in number. For on each side, below the twelfth, was another little one, join'd by a true articulation with the body of the first lumbar vertebra; but they were so short, that the length of either did not exceed two inches, whereas the other twelve on each side seem'd to be longer than usual. The number of the lumbar vertebræ was six; or, if you chuse to reckon that, to which the little ribs were affix'd, among the vertebræ of the thorax, (though in other respects it was most like the lumbar) then there were thirteen of those, and five lumbar. But the body of the fifth, having its usual magnitude and form, and the same processes join'd to it, unless that the posterior was a little less than usual, was so situated, that it inclin'd forwards, and to the right. It was divided from the os sacrum by a very thin cartilage; and even the left border, being connate therewith, was join'd to it in another manner likewise. For a kind of bony wing was sent out on each side, which leaving a foramen for the passage of the nerves, and filling up almost the whole interval,

terval, was plac'd betwixt the transverse processes of the vertebræ, and the upper sides of the os sacrum, and was closely connected with them by the joint call'd ginglymus. And the os sacrum was a little shorter than usual, less hollow'd in its anterior surface, and, as it went down, inclin'd a little to the right side. But if we except this lower vertebra already spoken of, there was nothing at all in the whole chain of them that was preternatural.

But let us now go on to the head, for the sake of which, principally, this dissection was perform'd. While the skull was saw'd through, a quantity of serum came forth; and the upper part of it being taken off, and the brain being dissected in its natural situation, we first observ'd, that the dura mater was thicken'd. And the vessels that ran through the pia mater, were all distended with blood, as if they had been fill'd by injection. This blood was such as that of the whole body was, black, and not very fluid. And under the same membrane, in the convolutions of the brain, was seen a transparent water, of the same kind with that which was found in the lateral ventricles only, afterwards; yet the choroid plexusses were not at all discolour'd, although they had vesicles upon them, turgid with water, and one of these vesicles was equal even to the bigness of a grape. This was in the left plexus, which being taken off, the thalamus nervi optici appear'd not of the same colour as the right thalamus, but brown. As I cut the brain into small pieces, I observ'd, that every other part of it was natural and sound; but that the medullary substance, which was on the external side of the left thalamus, spoken of above, was very soft, and liquefied, and was found to be mixt with a certain bloody fluid, of a colour almost effete; so that nothing but a disagreeable smell was wanting to make us pronounce it absolutely rotten. The space of the brain, which this disorder occupied, was larger than that which the largest walnut would have taken up; and that colour of the bloody fluid was most manifest in the middle thereof. It was more natural to take notice of this difference, because the cerebrum, in general, as I said, was of its natural colour; and not only more hard than the cerebellum, but even endow'd with a wonderful hardness every where, especially in the whole right hemisphere; and had only in that place I have mention'd a kind of bloody colour, and a loose ill-compacted substance.

7. I believe that this was an apoplexus sui generis (*m*), which is agreeable to the opinion even of Avicenna (*n*), that an apoplexy might have its origin "from an apoplexus form'd by repletion;" the violence of which was encreas'd in the patient in question, by the water being extravasated, and by the vessels being distended. But this apoplexus happen'd about the very place, in which, as I have already said, organical injuries most frequently happen, according to my observations (*o*): and in the first history of Valsalva, we have an apoplexy arising from an abscess, which was form'd in the very same place (*p*). Moreover, both in that, and in the other (*q*), and this of mine also, you see this doctrine confirm'd, that the injury of the brain is found in that hemisphere, which is opposite to the paralytic side of the body.

(*m*) Vid. Epist. 9. n. 16, & seq. usq. ad 20.

(*n*) Canon. l. 3. F. 1. tr. 5. c. 12.

(*o*) Epist. 3. n. 18.

(*q*) n. 4.

(*p*) Supra, n. 2.

8. But the inflammation of the bladder in our apoplectic patient, and its great distention with urine, in consequence thereof, brings to my mind that large collection of urine, which I found in the ostler, whose history I have given you (*r*); and that also, which was no less considerable, that I found in the bladder of an old woman, whose history I shall give you hereafter (*s*). From these observations, and others of this kind, you will understand how easily it may happen, that when apoplectic persons drag on life a little longer than usual, a new accession of disorders shall be brought on from a retention of urine; which retention is less likely to be observ'd, because, as they can swallow but few things, and those liquid only, and the urine frequently, by reason of the weakness of the sphincter vesicæ, runs away by drops, and wets the bed; the attendants are satisfied with these discoveries, and never think of warning the physician of a retention of urine. It should be the business of physicians, therefore, to order, that the lower part of the belly be now and then felt, so that if a fulness of the bladder indicate, that the urine is not discharg'd, some art should be made use of; and if the case require it, a silver catheter, which is easily done in women, should be introduc'd by the hand.

9. But perhaps you will expect, that I say something of those two circumstances, which I mention'd merely on account of their extraordinary nature. I will therefore tell you, what I immediately said on that occasion, to those who were present, as I am us'd to do. As to the two foramina, observ'd in the septum transversum, through one of which one of the hepatic veins pass'd, to go up to the vena cava; I confess it was rare; but it was much more extraordinary, that I demonstrated the very same circumstance three times in the space of two months: twice in the theatre, in the month of February, and once in the hospital, the month after. But I have not only seen two, as in these three bodies, but I have even seen three foramina in the diaphragm, once and again (*); one very large to transmit the cava, and two lesser ones to give passage to two hepatic veins: the first time was at Bologna, in the year 1700, in a diaphragm which was publicly demonstrated there, when I assisted Valsalva in his dissections; a rough sketch of which, drawn by myself, I still preserve; and the second at Padua, before the year 1726, which one observation only, I mention'd in the first of the *Epistolæ Anatomicæ* (*t*), without ever thinking, as frequently happens, of the other, which was of a more ancient date; and to this passage it is, that the very learned and ingenious anatomist Haller, refers (*u*), where he confirms, that what "I have observ'd is indeed very rare."

10. But in regard to the number of ribs; as I once saw only eleven (*x*), so, I say, I once saw thirteen, and not oftner; and I confess that Galen wrote truly (*y*), when he asserted, "these appearances to be so rare, that "you will scarcely find so great a number of ribs in one among a thousand;" yet he declar'd the first number to be much more extraordinary than the

(*r*) *Epist.* 4. n. 19.

(*s*) *Epist.* 56. n. 12.

(*) *Vid. & Epist.* 60. n. 6.

(*t*) n. 26.

(*u*) *Dissert. de Musc. Diaphragm.* ad §. 73.

litt. c.

(*x*) *Vid. Adv. Anat.* 2. *Anim.* 33. in fin.

(*y*) *de Anat. Admin.* l. 8. c. 1.

other. In respect to the second number, however, which is thirteen, Archangelus Piccolhominus (z), without doubt, believ'd what he said to be true, when he affirm'd, "that all antiquity had observ'd, that if the ribs exceed "their natural number, it was in one side only that a supernumerary one "was, and not in both." And indeed Columbus (a) also, had found "only "one little rib," beside the twenty-four, as what he has added signifies, and the marginal notes confirm. Nevertheless, not to mention Bauhin (b), whom Piccolhominus could not have read, and who says, that he had found thirteen ribs on each side, in such a manner, that in the left eight were true, and in the right six spurious; he might have known, that Columbus himself had afterwards seen (c) even "six and twenty ribs." And that Fallopius (d) had found, "in two bodies, the number of the ribs encreas'd to thirteen in "each side, by the addition of two ribs, so small, that they seem'd rather "to be rudiments of ribs only." And with these observations of Fallopius, mine very well agrees, as it does also in that which he adds, "that the "coarticulation, which, in other men, is us'd to be in the twelfth vertebra "of the thorax, was not at all varied in these." But you readily see how far what he has said differs from my observations, when he tells us, "that "he had found thirteen thoracic vertebræ in them, but in the loins only "four;" which Columbus and Bauhin said nothing of. Though, perhaps, you may think, there is some reason to suspect, that the vertebra describ'd by me, as a fifth lumbar, belong'd in fact to the os sacrum; but if you attend to all the circumstances; or rather, if you look never so slightly on the bone, which I preserve by me; there is no doubt but you will determine at first blush, that it is rather to be reckon'd among the vertebræ of the loins. Nor indeed have I been more prolix on this head, because I was ignorant how many anatomists after him have seen the same thing; but because I was not willing, that in reading this observation you should be uninform'd of those circumstances which others have omitted. For you know, that by reason of the situation in which the two thirteenth ribs were found, not being specify'd, Hunauld had undertaken (e) to explain their origin in such a manner, that his explication takes place when they are in the same situation in which he saw them, to wit, above the two uppermost ribs; and not when they are where I found them, to wit, below the two lowermost. Nor does the suspicion of some people escape you, that when they are found in this place, they are nothing more than the transverse processes of the first lumbar vertebræ, a little longer than usual: and not true ribs beside them, connected by a moveable joint, as I have shewn. But let us return to those things which are really preternatural.

11. A taylor, who us'd to drink very hard, being taken speechless, died within two days. Alexander Bonis, whom I have before commended, and other learned Venetian physicians, and the young students in anatomy, not being able to inform themselves of any more circumstances relative to him, and having had the body given to them, begg'd of me, that I would dissect,

(z) l. 8. Anat. Prælect. 8.

(a) de Re Anat. l. 1. c. 19.

(b) Anatom. l. 2. c. 8.

(c) l. 15.

(d) Obs. Anat.

(e) Mem. de l'Acad. R. des Sc. A. 1741.

and carefully demonstrate the brain. This was about the end of March, in the year 1708. The viscera of the abdomen were all found. In the left cavity of the thorax, was a little bloody water. The lungs were rather heavy, and upon pressure emitted a kind of froth, yet their substance was found. The heart was flaccid; and in the right ventricle, auricle, and pulmonary artery, were polypous concretions. In the left side were none, but only a little half-concreted blood in the ventricle. The aggeres, as Valsalva has since call'd them (*f*), of the femilunar valves, were very prominent, and of the hardness almost of a cartilage. In the aorta, and the carotids, was a large quantity of fluid blood, but still more in the pulmonary artery.

When the head was sever'd from the trunk, much water ran out of the vertebral tube, and the same kind of fluid was presently seen under the pia mater, in great quantities, not without an appearance of jelly. But what struck us most was a kind of white sanies, extended over all the surface of the anterior lobes of the cerebrum; which matter, when accurately examin'd, appear'd to be a true sanies, but inodorous, being inherent in the very substance of the pia mater; the surface of the brain being, as far as we could judge by our senses, altogether unhurt. This membrane also was easily separated from the brain, by the gentle drawing of the hand; and the cerebrum, cerebellum, and nerves, had the greatest flaccidity imaginable. All the vessels, even the smallest and internal vessels, were turgid with blood; and in the sinusses, especially the largest, were polypous concretions. In the lateral ventricles we observ'd there was a little water, and that the colour of the plexusses was somewhat pale and dilute; and, finally, in the pineal gland, was a very little bit of hardish matter.

12. Even our Adversaria will prevent you from insisting upon this little bit of hardish substance (*g*), as therein I have mention'd, that the same kind of matter has often been found in the pineal gland both by me and by others; and our letters to you also will prevent it, as in these you will see that observation confirm'd (*b*). Do not, however, imagine, that I do not suppose it a disease, for I do; but a disease, the effects of which are very obscure and uncertain, because it sometimes occurs without any foregoing symptoms, sometimes has evident signs of disorder preceding it, and at other times is join'd with different disorders of the brain. And indeed, John Salzman, who was when living a very learned physician, in his "Dissertation on the pineal gland becoming stony," after having more diligently than any other to this day, collected almost all the examples of this gland being calculous, which were at that time extant, did not doubt (*i*), but that it was the cause of intolerable pains in the head, or of idiotism, when it was become universally stony, as in the man spoken of by Präilius in Schenck, in a virgin by Mangetus from Drelincurt, and in the old man from King, as it is found in the Philosophical Transactions of England. But it is not certain, whether the stone found by Pfeilius was this gland petrified; and King found greater disorders than that in the brain, at the same time; and Drelincurt did not only find the gland stony, but increas'd even to the bigness of a hen's egg:

(*f*) Dissert. Anat. I. n. 10.

(*g*) VI. Anim. 9.

(*b*) VI. n. 12. X. n. 17. XI. n. 11.

(*i*) Thef. 15.

so that, had it been an hydatid, or any thing else whatever, it would doubtless, by its increas'd bulk, have brought on considerable disorder. But as to what relates to the nature of this disorder, it has seem'd to some men of learning, and particularly to Jo. Valentinus Scheidius, in that dissertation (*k*) in which I see he has far exceeded those celebrated observators in other instances, who have asserted, that the brain, being become a stony concretion, as was believ'd, was only degenerated into bone; it seem'd, I say, that this induration found in the pineal gland, was to be referr'd to the class of bony, rather than of stony, concretions. Which though I cannot deny of those little bodies, that were seen by neither of us, yet I can safely affirm of those which I myself found, that they were to appearance stony; inasmuch as being compress'd betwixt my fingers, they separated into little rough sandy particles, and were therefore evidently friable; which property he gives as the chief criterion whereby to distinguish the one from the other. And to this purpose, also, is applicable what I shall speak of hereafter (*l*), that I have sometimes found within this gland a mucous yellowish matter; and often the same matter, and of the same colour, on the outside of the gland, and on its anterior surface, and especially at its basis anteriorly (*m*): which matter being sometimes not very hard, or scarcely harden'd at all, yet when compress'd between the fingers, seem'd evidently to contain some little sandy particles. But in the same places, in other bodies, it was manifestly concreted into small granules (*n*); or though this matter itself was not found, yet some hardish little bodies were found in its place (*o*). But is it not more probable, that these corpuscles, whether they were within or without the body of the gland, since they appear'd to us of the same colour, as that sandy matter generally is, to wit, yellow, or yellowish, and to Vieussieu also (*p*), to Laubius (*q*), and to Salzman (*r*), were really calculi, form'd by degrees from the earthy particles of that matter concreted, as the watry were more and more consum'd, than little bones? especially since others who have seen them, a very few excepted, have call'd them, sand, gravel, and small stones; and not only those who are spoken of by Salzman, but others also who had written before, and among those, two whom the celebrated Haller (*s*) points out, Pechlinus and Brunnerus, and those who liv'd afterwards, whom we read of, for instance, in the Acta Cæsar. N. C. Acad. (*t*); and besides these, that celebrated man Phil. Conradus Fabricius (*u*); and because we cannot mention all of them particularly by name, he at least whom we very lately read, the ingenious Martinetti (*x*), by whom three calculi of this kind were found in the dissection of the archbishop of Ravenna. But if you examine the author, who, when I attend to my peculiar observations of these appearances occurring on the outside of the gland, seems to be by far the first who has made mention of them, you will naturally object, that the ancient physicians look'd upon

(*k*) De duob. offic. in cereb. apopl. quæst. 2, & 3.

(*l*) Epist. 21. n. 24.

(*m*) Epist. 1. n. 10. epist. 3. n. 14. epist. 8. n. 9, & epist. 14. n. 35.

(*n*) Epist. 8. n. 6.

(*o*) Epist. 7. n. 15. epist. 8. n. 15.

(*p*) Neurogr. l. 1. c. 11.

(*q*) Eph. N. C. cent. 9. obs. 63.

(*r*) Diff. cit. Thef. 13.

(*s*) Ad prælect. Boerh. § 296. not. p.

(*t*) T. 5. obs. 68. t. 6. obs. 14.

(*u*) Idea Anat. præct. sect. 4.

(*x*) Lettera della Separaz. degli umori.

these little bodies as bony or cartilaginous. That is to say, Galen, in his book *De anatomici administracionibus* (y), the title of which promises nothing of that kind, (and for this reason, I suppose, it has happen'd, that his words have never been quoted by any author on this occasion, as far as I know, unless perhaps most authors have understood them as Vesalius (z) did, who was on that account blam'd by Riolanus (a) ;) Galen, I say, writes, that in his time it was enquir'd, "whether any thing cartilaginous, or bony, was contain'd within the gland of the cerebrum, which from its turbinated figure, or its likeness to a pine-nut, is call'd by the Greeks *κωνάριον* ? in like manner also, whether, in every heart, it was common to find a cartilaginous, or bony particle, or in large hearts only." Nor let your opinion be bias'd by this circumstance, that Galen places both these questions among the frivolous subjects : for he shews, that the second is a useful one, both in this work (b), and in that entitled, *De usu partium* (c) ; since he has treated of it too largely to suffer us to suppose that he could esteem it trifling ; so that you see what he meant by the word frivolous. And why he endeavour'd to disprove the first, you will know from Riolanus (d). But in our days we consider both kinds of bone, not as naturally, but præternaturally form'd ; and even I confess, that not only what I have hitherto found on the outside of, but within the gland, has seem'd to me to be much less a bone, than a concretion similar to a calculus, for the reasons I have pointed out above. And you may also add this argument, that green concretions (and little stones of this colour have been found by Vessius (e) in that place) may more easily be form'd from a green matter, than that green bones could be at any time generated. But however, if any appearances of this kind fall into my hands again, I have determin'd not only to attend to their hardness, or the smell of them when burnt, but also to enquire into their nature, by other experiments ; and in the mean while, to leave the subject at large, as I have done on other occasions.

13. And I am still more under a necessity of doing so, in regard to the source of that true sanies, which I describ'd in the history of the taylor above. I should suspect, it was translated from the lungs into the skull, if as I found them of a very strong smell, so I had found them injur'd in any part ; as it seems that sanies has been sometimes carried from the brain to the urinary passages, both from other observations, and from that which the learned Hippol. Franc. Albertini related, as observ'd by him in a barber ; who being seiz'd with pain in the head, and a sense of weight in the vertex, from too long continuance in the heat of the sun, and at length with fever, delirium, distensions of the nerves, lethargy, and palsy, was freed from his disorder by a sudden flow of urine, in which pus subsided. And indeed he was bad in his head some years ; yet when these things were related to me, he was living, well, and sound. And that pus might be carried from the lungs to the brain, (as I said, I should have conjectur'd in the case of the taylor) or from

(y) 4. c. 1.

(z) De corp. hum. fabr. l. 1. c. 6.

(a) In l. Galen. de ossib. post c. 32.

(b) L. 7. c. 10. (c) L. 6. c. 19.

(d) C. cit.

(e) Apud Salzmann. Thes. cit. 13.

the pleura in like manner, Duretus did not doubt, and Parrey seems to have ascertain'd, as you read in the Sepulchretum (f).

14. But besides pus being generated in the brain, or translated thereto, I have no slight suspicions, from the dissections I am about to relate, that other causes, hitherto less observ'd, may sometimes bring on an apoplexy, or concur in the production of it. The first dissection, though not perform'd in my presence, I shall nevertheless give to you, just as if it were my own. For Nicolas Mediavia, public demonstrator, and most deservedly doctor of the sacred college of physicians and philosophers, was present, to whom I would trust as readily as to myself, by reason of his known diligence, for these eight and thirty years past; for it is so long since I began to exercise him in anatomical business; and so great is his assiduity, that he has not only been present at almost all the dissections I have perform'd at Padua, but also frequently, by dissecting and demonstrating with me, has given me very useful, and very laudable assistance. In this manner, therefore, he made me the relation of a patient's history, whom he had in course attended, as physician at the hospital in Padua, and whom he order'd to be dissected after death, under his inspection. This was on the twenty-fourth day of March, in the year 1740; and on the same day he related it to me.

15. An old man, who had an ulcer in his leg, was suddenly seiz'd with a pain in his head. As some disorder seem'd to threaten the brain, he was immediately let blood that morning. Nevertheless, at the twentieth hour, he was attack'd with an apoplexy, and a palsy of the right limbs. A palsy of all the lower parts soon follow'd this, and in a few days death.

The head being examin'd, that artery with which the vertebrals anastomose, and those which are carried directly over the corpus callosum, were turgid with blood; but the remaining vessels were not so. In both the lateral ventricles was a good quantity of water, and the plexus choroides were pale. The septum lucidum was broken through anteriorly. But what was most striking, all the medullary substance of the right hemisphere was very brown; yet not that of the left.

16. When I heard this relation, it brought to my mind the priest of Verona, in whom, after dying suddenly of an apoplexy, I found the whole medullary substance of the brain become brown, as I have written to you before (g). Whatever the cause of this change may be, for I then told you, that it did not seem to be blood from whence that white substance is so tainted, should it not have a place among the causes of apoplexy? For although in this old man, the first palsy was on the right side, and the discoloration observ'd on the same side of the brain, and not on the opposite; yet you know that the doctrine of Valsalva answers almost in all; though not altogether in all (h). But let us now go on to less obscure subjects.

17. There was an Æthiopian at Venice, who was thirty years of age, of a muscular make, and in good health, unless that in the last months he had been subject to a certain languor of his stomach, join'd with a slight sweating, which, however, immediately went off, on taking food. This man, about the middle of July, in the year 1708, being very chearful with his friends

(f) L. 1. f. 1. obs. 40.

(g) Epist. 4. n. 21.

(h) Epist. 2. n. 16.

at breakfast, for it was in the morning, and standing to play on the trumpet, as he us'd to do; while he was playing, fell backwards so gradually and slowly, that his companions would have thought he did it by way of amusement, if they had not observ'd certain tremors running over his whole body as he fell. He died, however, the very moment that he fell.

The celebrated Santorini, as he generally us'd, solicited me to be present at the dissection. It was about the twelfth hour after death. We observ'd the upper limbs to be somewhat rigid, the neck was blacker than the other parts of the body, as if from stagnating blood, and the eyes were like the eyes of a living man. In the abdomen every thing was natural, except that the omentum was too short, and the edge of the liver itself almost livid, and the membrane of the spleen on its adhering surface, grown white, and almost tendinous, in a certain spot. Therefore nothing took up our attention more than a great number of lacteal vessels, distended with chyle, and knotty, which embrac'd the small intestines on the one hand by many roots, even on the parts opposite to the mesentery; and on the other hand, went in a radiated manner, towards the center of the mesentery, where very long and large glands appear'd. As we were about to open the thorax, we much wonder'd at the unusual hardness of the cartilages, that join'd the sternum to the ribs, and especially in that age. The lungs were entirely sound, although the right lobe was in some places, and the left lobe in its whole upper part, connected to the pleura, by membranous bands; and both of them contain'd more serum internally than usual. In the pericardium also, was a larger quantity of water than usual, and that was thick and turbid. But the heart was of its natural firmness: and in its cavities was a fluid blood, which was also found in considerable quantity in the aorta, and especially in the pulmonary artery. On the external surface of the heart, and in the whole of the thorax, the blood-vessels were very conspicuous. At length, having open'd the brain, water was found under the pia mater: moreover, in the lateral ventricles, but especially in the left, was more fluid contain'd than is natural: yet the plexus choroides were of their usual colour, and had no hydatids among their vessels: and the cerebrum was of its natural firmness. The vessels of the brain, and its sinusses, were rather empty than full; and what little blood they had in them, was without the least concretion; so that in this body the blood was found to be every where fluid. But we saw no where, except within the cranium, that appearance, for the sake of which, principally, I undertook to describe this history to you. That is, the sanguiferous vessels, which were also spoken of in the former dissection, that pass'd over the corpus callosum, were distended with air, intermix'd with a little serum. So that artery likewise, which goes through the basis of the medulla oblongata, and takes its origin from the junction of the vertebrae, and other vessels also, in the upper surface of the brain, were transparent from the included air, that distended them.

18. Although other causes of this so sudden death do not seem to have been wanting within the cranium, if those things, which were propos'd in the last letter, please you; yet whether you believe, that they are not altogether satisfactory here, or you think that this last cause, whenever it occurs, is principally to be attended to, I will not conceal what my opinion,

or rather my conjecture, is thereon; and this, after having consider'd all the arguments that were made use of by the Italians, in their disputations, about the beginning of this century. And I shall do it the more readily, because I have observ'd the blood of other bodies, and not this only, to be frothy, and intermix'd with air-bubbles. It is then certain, that air is naturally contain'd in the humours, and particularly in the blood; for to omit other more ambiguous proofs, if a segment of a vessel, suppose a venous one, of a living animal, be tied very tight with a bandage on each side, and be cut off from its connections, and put into the machine of Boyle, so that the circumambient air may be drawn away, the air which is included within the vessel will then greatly distend it. And indeed, if it were not so, the force of the external air, with which we are surrounded, and every where compress'd, would have such an effect on the vessels, as to put an immediate stop to the circulation of the blood; which is now prevented by an equal resistance within. For since, like this external air, to use the words of Plato (*i*), "when it is preternaturally compress'd, by its natural elasticity, it endeavours to recover its former situation;" therefore, while neither prevails, but a perfect equilibrium is kept up, no danger can happen. But that it may afford this and other advantages to the blood, which it is needless to mention now, and no detriment; it is necessary that the air should be dispers'd in small particles, so as to be almost dissolv'd, and imperceptibly mix'd therewith. For if they once extricate themselves from the embrace of these particles of blood, and one particle of air meet with another; like small globules of quicksilver, they immediately coalesce into larger globules, and forming to themselves a kind of coat from the viscid serum of the blood, appear very conspicuously in the form of bubbles; or, to use the words of Plato (*k*) once more, "Bubbles are form'd from the included air being surrounded with moisture, which, though they cannot be seen separately, by reason of their smallness, yet, when join'd together, and swell'd into a larger bulk, they become extremely conspicuous." But these bubbles, or the air itself, which is set at liberty by their rupture, if it be interpos'd in any quantity, betwixt the portions of blood, opposes their motion; nor does it suffer the portions which are behind to be in contact with those that go before, or to communicate to them the impulse which they have receiv'd from the heart, and larger arteries. And the blood also is less capable, on this account, of being sensible to the impetus; for the air being with difficulty impell'd into the smaller arteries, must have much more difficulty to pervade their more narrow desiles, as it is thrust farther into the vessels: and this anatomists are well acquainted with from experience, as frequently some included air stands in the way of the liquor they have injected. The air, in the mean while, not only distends the smaller vessels, and streightens others contiguous to them, but also takes away, in great measure, the power of contraction from those which it has distended. And this being the state of the question, it appears, that if air should beset many of the smaller vessels of any certain part at one time, the motion of the blood, and every thing depending thereon, must be interrupted. Suppose then, that this part is the

(*i*) In Timæo.(*k*) Ibidem.

brain, and you will instantly understand how an apoplexy may arise therefrom: and you will commend Hollerius (*l*), who expressly says, that apoplexies “are brought on, even when the carotid arteries are obstructed, in “the retiform plexus, by flatus, or by any thing else:” and you will commend still more Hippocrates himself (*m*), whose words are these: “If much “flatus, or air, is dispers’d through the whole body, the whole man is plannet-flruck; if through a part, that part is blasted:” and a little lower, where he ascribes even the epilepsy to flatus, that is, “when a great quantity of air is mixt with the blood through the whole body; for then,” says he, “many obstructions happen in many places throughout the veins; and “when the air comes into the larger veins, and those that are fuller of blood, “and its progress is check’d for a considerable time, the course of the blood “is interrupted thereby; for the air stagnates in some places, and penetrates into some parts more slowly, and others more quickly.” Perhaps you will here enquire, by what method the air gets at liberty from the particles of blood with which it is involv’d, so as to make this confusion. And I will tell you what is my conjecture on this head, if you will give me leave, first, to describe and explain to you the last history, in which air was not only found in the vessels within the cranium, but in all the vessels of the body also, and that in great quantity.

19. A fisherman of Venice, of more than forty years of age, of a tall stature, and afflicted with a rupture, being liable to flatulent complaints in his belly, was suddenly seiz’d with them as he sat in his boat, and immediately died. I dissected the body in company with my friend, whom I mention’d above, the celebrated Santorini, on the day after his death, which was in the year 1707, a little before the middle of October. His abdomen was swell’d, from the stomach and intestines being distended with air. The stomach was also pretty red, from the veins which go into the gastro-epiploicæ being turgid with blood. And the trunk of the gastro-epiploicæ itself, which was in this body single, was so tumid, that it would every where admit my forefinger. Yet no sooner was it cut into, but it shrunk; for it contain’d a large quantity of air, with a little frothy and black blood. The larger tract of the small intestines was red for the length of a span, except that for about three fingers breadth, where it went down into the hernial sac, in the form of a small arch, it was discolour’d with a gangrenous appearance; yet its substance, as well as that of the other intestines, was pretty firm. The sac also was ting’d with the same colour, but not so much, and loosely surrounded the intestine, without cohering with it: it was compos’d of the relax’d peritoneum, and lay very near the tunica vaginalis of the spermatic cord, whatever that be; but still on the outside thereof. Not far from this, almost over the middle of the bones of the pubes, was another sac form’d, not very large, into which, in like manner, another portion of the intestine had been us’d to fall; but it was at that time empty. The concave surface of the liver was here and there livid, yet to a very little depth in the substance. In the gall-bladder was contain’d bile, of a very deep, and almost black, yellow; and in this bile was a calculus, which, in its size, blackness, and gra-

(*l*) Comment. in Hippocr. S. 3. Aph. 23.

(*m*) de Flatib. n. 19. & 21.

nulated surface, resembled a mulberry; and this being held over burning wax, did not take fire. The spleen was large, but firm. Before we touch'd the viscera, we had seen bloody serum in the cavity of the abdomen, in such a quantity, that we were oblig'd to make use of sponges, to absorb it.

In the cavity of the thorax, however, was nothing of that kind. But the pericardium was so connected on all sides with the heart, that by pulling away the former, the latter was in some places torn. The heart was large and flaccid. And black frothy blood, scarcely coagulated in any part of it, was found in both the ventricles: the same kind was also found in the right auricle, though with a more compact concretion; but in very small quantity. Nor was there any vein through the whole body, wherever we inspected it, which was not distended with frothy and black blood. And a little of the same also was seen in the aorta and carotids, as they pass through the neck. And the trunk of the pulmonary artery was not only very turgid with this kind of blood, but with air also. The lungs were found, notwithstanding the internal surface of the *aspera arteria* was beset with a kind of filthy humor, partly of a cineritious colour, and partly of the colour of tobacco. And the same tube where it lay on the neck, but the larynx still more, was internally black, livid, and gangrenous; and the parts lying near it were in the same situation. While we were examining these parts, a thin pus, as if from a ruptur'd abscess, flow'd down into the pharynx, from the posterior nostrils, in a moderate quantity.

In the cavity of the cranium, the sinusses, but particularly the other vessels, which go through the *dura mater*, were turgid with frothy blood; as were all the vessels whatever, that ran through the *pia mater*, whether in the basis, or circumference, of the cerebrum, and cerebellum, or in the ventricles; and the smaller vessels were still more turgid than the large ones. Moreover, from the substance of the cerebrum and cerebellum, when cut in pieces, more large drops than I have ever seen, flow'd out spontaneously in every part. Between the two meninges was a little serum, and under the lower still more; so that it was easily drawn off from the brain. There was a small quantity of the same kind of serum in the lateral ventricles. Yet the plexus choroides, notwithstanding they had many vesicles distended with water on the posterior part, were very red; and the substance of the brain, far from being lax, was very firm. In this body, however, I observ'd two circumstances, which are describ'd in the *Adversaria* (*n*): the first was a cavity within the beginning of the spinal marrow, of so large a size, that I never saw the like, or any thing approaching thereto, before, or since; and as I then expressly acknowledg'd, that it was far beyond the bounds of nature, so now, I do not doubt, but it was much enlarg'd, from the expansion of the extricated and elastic air. The second was a vehement inflation of the interior membrane of the scrotum with the same air, being made up, as it naturally is, of cells every where communicating with one another. Which inflation was still more to be attended to, because the scrotum was scarcely at all tumid, before we touch'd the body; yet in the little time in which the dissection was perform'd, it was extended to that immense size. But this dissection was

(*n*) VI. *Animad.* 14. & IV. *Animad.* 1.

the sooner finish'd, because the gangrenous stench could be no longer born, either by me, or by those who assisted me in the dissection.

20. I have heard and read of dissections, in some measure, similar to this. For I remember that Valsalva said, he had met with all the veins and the heart distended with air, in a body he had dissected: but he neither left a memorandum of it in writing, nor did he mention of what death the man died. And I know from the celebrated Verdriesius (*s*), that Pechlinus, whose observations are not now in my hands, "saw in the body of a man who "had died from the oppression of long-continued pains in the belly, and "streightness in the chest, not only the abdomen, and stomach, fill'd with a "large quantity of flatus, and blown up like a bladder, but also the cavity "of the heart, and its right auricle, immensely encreas'd from the same cause; "so that the heart was, by two parts in three, larger than its natural size, "but entirely empty of blood. And besides this, the veins of the whole "body, the coronary not excepted, were distinguish'd by included air, and "exhibited to the eye a most beautiful picture; that is, an alternate mixture "of columns, of purple juice and aerial fluid, such as is seen in some kinds "of thermometers." So the learned Jo. Henricus Grætzius (*p*) mentions a woman, "who died, in a very miserable manner, of continual faintings, pain, "and suffocating anxieties; in whose heart not the least drop of blood was "found, but the cavities of it were universally distended with air: so that "you would have call'd it a tympany of the heart." And last of all, Ruysch asserts (*q*), that he found, "in a woman who died suddenly, a heart "enlarg'd to an amazing magnitude with air, of which it was full, almost "without any blood: and this was evidently prov'd; for on thrusting the "point of a knife into the heart, it subsided suddenly, as if it had been a "bladder fill'd with air, and touch'd with the point of a knife." But all these found the heart itself distended with air, which I never saw. And even Ruysch thought, that the woman had died from that cause, that is, "from "too great a quantity of air being collected together in the heart, and preventing the entrance of the blood thereinto."

21. That death also, which happens in quadrupeds from air being injected into their veins, seems to be referable to this class; I mean, as is the case in the Wepferian experiment, as Brunnerus (*r*) call'd it. And indeed, Verdriesius, whom I have already commended (*s*), has mention'd that experiment as made by Wepfer, "who only by inflating with his mouth the jugular vein, did, once on a time, lay prostrate and kill an ox, of a stupendous size." And Rudolphus Jacobus Camerarius (*t*) confesses, that he was stirr'd up to make the like experiments with Wepfer, from the example of the sheep and the cow, that were thus kill'd by him. But if Wepfer was really the author of that experiment, he must have perform'd it long before they wrote of it; yet I do not remember to have found the least mention of this affair in any of those writings which he publish'd before the year 1667:

(*s*) Differt. Epist. de inflat. ureter.

(*p*) Disp. de hydr. pericard. in procem.

(*q*) Resp. ad Epist. probl. 16.

(*r*) Eph. N. C. dec. 3. a. 4. obs. 73.

(*s*) Diff. cit.

(*t*) Eph. cit. dec. 2. a. 5. obs. 53.

in which year Redi (*u*), in a letter to Stenoni, mentions, that he had kill'd instantly, by the same experiment, two dogs and a hare; and within the sixteenth part of an hour, in like manner, a sheep and two foxes; and therefore, he had been us'd, ever since that time, to affirm, that the intermission of the pulse was generally owing to some large bubble of air, which was passing through the heart: and this opinion he declar'd in a consultation (*x*), on behalf of a person who labour'd under an intermission of the pulse. But whoever made this experiment, even before Redi, Antonius Heydus, in those observations which he publish'd in the year 1683 (*y*), takes notice, that when he had at times injected air by the crural vein in dogs, "it pass'd through the abdomen with a rumbling noise, and in almost a moment of time reach'd the heart; then that the dog was seiz'd with convulsions; that respiration, and the motion of the heart, as far as could be perceiv'd, was so much at a stand, that the dog was cut open as being dead; that no blood then flow'd out from the intercostal veins; that the chest being open'd, a motion was perceiv'd in the right auricle, which continu'd long after; that the heart, together with the right auricle, was very much expanded; and that the point of the ventricles being cut off, pure unmix'd air first came forth, after that frothy blood, and last of all a fluid blood." That Heydus did not inject a sufficient quantity of air, or at least did not defer the dissection so long as was requir'd for the animal to be quite dead, you may easily gather from the experiments of Brunnerus and Camerarius. For Brunnerus (*z*) began his experiment in the same manner; and hearing a noise in the præcordia, he saw, presently after, the dog fall prostrate, as if seiz'd with a tetanus, and breathing very quick and fast, and to all appearance about to expire; yet the animal soon after arose: but at the distance of an hour's time, by repeating the experiment, he soon compell'd him to die, being immediately seiz'd with that kind of convulsion which is call'd *επιστάτονος*, and his fœces being discharg'd, and most of his vessels turgid with blood: and though no air was contain'd in the arteries, yet a great quantity was collected in the vena cava, and the auricles of the heart. But Camerarius (*a*) first threw air in small quantity and gently into the jugular veins; then, after some interval, vehemently and in large quantity: yet he never observ'd any rigor of the limbs, nor any concussion, but rather always a laxity, and resolution. At the first, indeed, he perceiv'd that the animal became mute and quiet, yet within half a quarter of an hour, it gradually recover'd: but after the air was forc'd in with vehemence, he died very soon, with frequent howlings and gaspings. And in one of them, for he made the experiment on two, when it was dissected, he found the ventricles and vessels of the heart so distended with air, that the pericardium was entirely fill'd by the heart, and the coronary vessels of that viscus contain'd more air than blood. But the right auricle, particularly, which could not be more expanded by any art whatever, contain'd no blood: yet blood, altogether fluid, and frothy, flow'd, together with air, from the ventricles, when wounded.

(*u*) Opera tom. 5.

(*x*) Consulti medici.

(*y*) Cent. Obs. Med. obs. 90.

(*z*) Comment. in Pan&. Secund. c. 9.

(*a*) Obs. cit. 53.

And in the whole round of the body, arteries, as well as veins, exhibited manifest bubbles of air, even in the smaller branches. Harderus (*b*) also threw air into the jugular vein of a dog, but much more strongly than the others; and the animal, after having howl'd a little while, immediately ceas'd to respire: and being open'd, his heart was found to be entirely distended; yet the sides of it, being wounded, immediately became collaps'd, "flaccid" and enervate," containing only a little frothy blood. Frothy bubbles also were every-where seen. Finally, that experienc'd man Sproegelius (*c*), as I have learn'd, while I read over again this letter, when he had impell'd a small quantity of air into the same vein of a whelp, found, that death, after some slight convulsions, was in a short time the consequence; and he found after death, the right auricle of the heart, and its annex'd ventricle, were extremely distended with air, as in like manner, all the veins of the belly. And as upon frequently repeating the experiment in dogs, and dissecting them after dying immediately therefrom, he confirm'd the opinion, that the heart was so distended with air, that it could not contract itself; so he also confirm'd, that therefore the motion of the blood was immediately stopp'd, but always found fluid by him, even more fluid than natural; and not, as some have affirm'd, and as one has said he saw it in the lungs, coagulated. For as to what relates to Bohn (*d*), he seems to have referr'd to the quickness with which air kills when injected into the veins, and not the change that it brings about in the blood; for he was speaking of this, when he said, "that it kill'd the animal, like the most powerful coagulator, or any other "poison." Nor will I omit the observation of Vallisneri (*e*), after having repeated the experiments of Redi, that not only dogs die sooner, and from the injection of less air, than sheep, weathers, and rams; but even that sheep do not die, if little air be injected.

22. And all these things I was willing to mention, that it might more easily be understood what was common in the experiment; and what differences, in like manner, there were in the effects, according to the different vein into which the air is driven, or the various quantity and impulse thereof, and finally, from the various nature of the animals, and the different disposition of their blood, and its passages. And there are even some animals, in whose blood do naturally exist many air-bubbles, being mix'd with it here and there, as tortoises, for instance; for in the species of this animal that lives at sea, Redi (*f*) found the sanguiferous vessels really full of cold blood, though the animals were then alive, and the blood extremely full of air-bubbles. This seem'd to him very wonderful, and he determined to make the same experiments in the land and river tortoises. Which when Caldesi, from his admonition, as I suppose, had done (*g*), he appears to have seen, through the coats of all the vessels, which were transparent, by reason of their thinness, those bubbles in great number fluctuating within their blood, which is actually always cold, yet concretes like the blood of other animals. I have myself, beyond a doubt, seen these bubbles, not only in the sea, but in the land

(*b*) Apiar. obs. 25. in schol.

(*c*) Exper. circa venena, § 42.

(*d*) Circa Anat. Prog. 4.

(*e*) Suppl. al Giorn. de' Letter. t. 3. art. 2.

(*f*) Cit. tom. 5.

(*g*) Osserv. Anat. int. alle Tartarughe.

tortoise; and besides, in very great quantity in vipers, and in trout, and in carp from the Lago di Guarda, as Lancisi (*b*) did in the hedge-hog; which species of animals have their blood cold, and, for the most part, a very per-severing motion of the heart. And perhaps this will help us to account for what was observ'd a little before (*i*), that dogs were sooner kill'd by this experiment than sheep, by supposing that the species of sheep is colder than the canine, and therefore less affected by air being thrown into the veins. But that we may not be too much in a hurry to draw general conclusions, which is a fault many naturalists and philosophers have fall'n into, let me observe, that in the serpent, so similar to the viper, I have sought for these bubbles in the blood in vain.

23. Let us now return to animals of a warm nature, and for that reason bearing so much the more analogy to ourselves; and we find it is manifest, that whichever of these creatures has been open'd, after dying from this injection of air into the veins, that fluid has always been found collected in great quantity in the heart, or its auricles, and so distending the parietes of its cavities, that they who have seen the appearance, Brunnerus (*k*), Camerarius (*l*), Harderus (*m*), and Sprægelius (*n*), have all agreed in this opinion; that the air, by its very great and obstinate distension of the heart, prevents its fibres from contracting, in the same manner, as an immoderate congestion of urine in the bladder hinders the contraction of the muscular coat thereof. And Harderus even thought, that the fibres of the heart were weaken'd, and enervated, in the same manner as those of the bladder. And if we attend closely to the subject, we shall find, that Heydus (*o*) was nearly in the same opinion with them: and if to these observations you transfer, as it is just you should, those which I quoted above (*p*) from Valsalva, Pechlinus, Grætzius, and Ruyfch, of the human heart being equally distended with air, you cannot avoid attributing the death of these animals, and those men, to the functions of the heart being obstructed.

24. And if I had found in the fisherman, whose history I have given you (*q*), the heart or its auricles distended with air, I should readily have believ'd that he died of the same kind of death. But now, although I am willing to acknowledge, that by reason of the pulmonary artery being so distended with air, as I actually saw it, the circulation was impeded in the præcordia; yet because I found the vessels in no other part equally tumid with frothy blood, as those of the cerebrum and cerebellum, it does not seem to me, that I should trespass beyond the bounds of reason, if I should account for the man's apoplexy, and sudden death, from the motion of this frothy blood being obstructed by the bubbles of air that were in it. For the narrow passages of those small arteries might easily be stopp'd up, their slender coats enervated by distension, and the origins of the nerves compress'd thereby. Nor are other dissections of apoplectic persons wanting, in the vessels of whose cerebrum air has been found. I shall produce two from Brunnerus (*r*) below.

(*b*) De Mot. Cord. Postul. 15. in schol. &

l. 1. f. 1. c. 2. digr. 1.

(*i*) N. 21.

(*k*) Eph. N. C. dec. 3. a. 2. obs. 223.

(*l*) In schol. ad obs. 53. cit. supra, ad n. 21.

(*m*) Schol. ibid. cit.

(*o*) Obs. ibid. cit. 90.

(*p*) N. 20.

(*n*) § 42. cit.

(*q*) N. 20.

(*r*) N. 30.

And even in Johannes Wilhelmus Albrechtus, professor of anatomy at Göttingen (*s*), when a kind of sleepiness, attacking him suddenly, had taken away his sensation and speech, and within two days his life, so that there were physicians who judg'd his disorder to be a real apoplexy, air was very evidently seen in the vessels of the brain. But in these three were other causes existing in the brain, from which, without that air, an apoplexy might happen; the force of which causes you may suppose to have been encreas'd thereby, though they did not take their origin from thence. But in the dissections of the Æthiopian (*t*), and of the fisherman, which I have given you, were no other causes in the brain that could be put in competition with them, except the air: and still less in a woman, who being to all appearance in good health, like the Æthiopian, fell down dead suddenly. For her body being dissected accurately, according to custom, by that excellent anatomist Philippus Conradus Fabricius (*u*), when he look'd for the cause of that kind of apoplexy, he not only found the substance of the brain firm, as I did in the two above mention'd, but even without a drop of blood, or serum, any where effus'd: so that he expressly affirm'd, that every true and speedily-fatal apoplexy did by no means arise from blood, or serum, being extravasated, nor from a congestion of blood in the vessels of the brain; for in that woman, the arteries and veins of the brain, and the sinusses of the dura mater, were found empty of blood, "but distended with air."

25. Now it remains only for me to endeavour to answer your question (*x*) satisfactorily, if it is possible to conjecture by what method the air, which is so accurately intermix'd with the particles of the blood, can extricate itself therefrom, so as to form such a number of bubbles on a sudden. And Littere, indeed, has lay'd it down as a postulate (*y*), that the air continues to be intimately mix'd with all the humours of our body, as long as they preserve their natural motion and fluidity; but if these two are diminish'd, that the air immediately detaches itself from them. Therefore, having found in the bodies of those who had died, a little after, large effusions of blood, many small branches of veins full of air (*z*), and giving two reasons for this appearance, he brings this as the first, that the motion of the blood was slower, by reason of the strength being broken, and that it was also very thick and dense, which he actually saw, and therefore the air had restor'd itself to liberty; the particles of the blood itself having been necessary thereto, since they were under a necessity of pressing out the particles of air from betwixt them, in order to come nearer to each other, and be condens'd. But I think, if we were not to add other things to the arguments of this experienc'd man, which would, in my opinion, illustrate his hypothesis, it would certainly follow, that we should see extricated and elastic air much more often in dissections than we do. However, I shall not add them here, because in the Æthiopian I found no concreted blood, and in the fisherman but a very small portion: so that the explication is to be enquir'd after in another place. Yet it will not be useless to have produc'd the hypothesis of Littere: for as the same ef-

(*s*) *Commerc. Litterar.* 1736. heb. 12. n. 1.

(*t*) *Supra*, n. 17.

(*u*) *Propemptic. ad Dissert. Jo. Barth. Hoffmanni.*

(*x*) *Supra*, n. 18. in fin.

(*y*) *Hist. de l'Acad. R. des Sc. a. 1714.*

(*z*) *Memoir de la meme année.*

fects may happen in different bodies from different causes; and as this effect is to be met with, according to Ruysch (a), "frequently in those who die suddenly;" it will certainly be of advantage to know many causes, that you may choose out at one time and at another, whichever, all things considered, may seem best to answer your purpose.

26. And with this intention we shall also consider the other cause of Littré, (which, though it does not relate to the extrication of air, yet relates to the too great quantity of it existing in the blood, which Ruysch and I have finally in view) I shall now consider, I say, the second of those two causes, which Littré invented; or rather, if we speak only of this second, that which he had, in some measure, received from Mery. For Mery (b) having pricked the vena cava of a living dog, above the emulgents, and observed that as the vein emitted its blood, it was filled with air bubbles, entering in together with the blood from the roots of the veins, and being the larger, as the blood was more exhausted; did not doubt, but these bubbles proceeded from the air; which being taken in by respiration, and carried to the pulmonary veins, was conveyed from thence, together with the blood, into the right ventricle of the heart, and aorta, and at length into the roots of the vena cava. This explication was so much the more ready and convenient to Mery, as he denied, that the air, even when admitted naturally by the pulmonary vein into the blood, could be intimately mixed therewith; inasmuch as it was already sufficiently replete with air, which was closely united with its particles, as it had been before with the particles of food and liquor, of which it was composed. Wherefore he judged, in fact, that this air was intimately mixed with the blood, much in the same manner as salt is dissolved in water; and consequently, that it would pass through any of the excretories or strainers of the body, together with the humours secreted from the blood; but that the other taken in by the pulmonary vein, like salt added to water, already saturated therewith, will always remain unmixed, and in its original form; and therefore can never escape from the channels of the blood, unless, when it comes to the pulmonary artery together with the blood, it return by the aspera arteria, the same way that it entered. But Mery (c) himself, had been some time before this of a different opinion; when he supposed, that the air, absorbed by the lungs, was "exquisitely" mixed with the blood in the pulmonary veins; and that left at any time, being too much increased, it should impede the contraction of the heart, "it was thrown off by insensible perspiration:" and as this was done "very slowly, in a tortoise," therefore air abounded in its vessels. And, in consequence of this, Littré, as he followed the more ancient opinion of Mery, in a state of body, that is sound and natural; so when the blood was diminished by profuse hemorrhages, and more condensed, he so far approved of this more recent opinion, as to deny with him, that the air could at that time be intimately mixed with a blood of this kind, and to bring the bubbles by the same way as Mery did, into the roots of the veins.

(a) Resp. ad Epist. probl. 16.

(c) Vid. Du Hamel. R. Sc. Acad. Hist. 1.

(b) Mem. de l'Acad. R. des Sc. A. 1707.

4. S. 2. c. 3. n. 12 & 13.

27. But it is not necessary, nor indeed is it possible, to consider accurately here, all the arguments relative to the passage of air to and from the blood; since, as Celsus has said on another subject (*d*), “ these things have been often treated of by physicians, through many volumes, with great earnestness of disputation, and will still be a matter of contention.” There were formerly, and there are now, those who contend, that air is even admitted, and emitted, through the pores of the skin; and they say, that Asclepiades had a view to this, when he attributed so much efficacy to frictions, to wit, that they open’d a passage outwards for the air, which was corrupted, and spoil’d, by long retention, and gave entrance to that which was fresh and wholesome. And there are some among these, who hold, that it is carried in and out by the aspera arteria, especially in that manner which Jo. Alphonso Borelli (*e*) has previously hinted, that is, mix’d with a watry humour, and in some measure dissolv’d; so that they think, it may easily enter the lymphæducts, and the veins. But I cannot help wondering at some of them, who, though they admit air so freely through the lungs of the skin, do not equally admit of its passing by the way of the chyle, with which it can be shewn to be intimately mix’d, in the same manner as with the blood, according to what I said above (*f*); but either take no notice of this passage, or entirely deny it. Nor does it escape me, that there are some, on the other hand, who openly dissent from all these opinions. And in regard to the lungs, I very well remember hearing a celebrated doctor, when, from the rostrum, he deny’d, that if we take the most recent lungs, having cut off their vessels at the basis of the heart, put them into water moderately warm, and inflate them more strongly than frequent respiration generally does; he deny’d, I say, that the least bubble of air ever appear’d in the water; which was a manifest proof, that the air was in no manner transmitted into the pulmonary vein. But however, at the time when I was making many experiments on the parts both of animal and human bodies, with my friends at Venice, I saw the trunk of the pulmonary vein fill’d with a frothy humour, by inflating the lungs, especially by repeated and long-continued, though not violent, inspirations: and after others, I read Bergerus (*g*), who testifies, that water injected by the bronchia, without applying any force, pass’d through, and came frothy into the pulmonary vein; and that being injected by a branch of the pulmonary artery, it also return’d by the bronchia. And from that time I was never so averse to the opinion of those who thought that the air, not only enter’d the blood by innumerable and separate little foramina, that it might be better mix’d therewith, or at least of those who consider’d its being perform’d in the same manner that Borelli taught, but who thought that it came out the same way; I say, I was not so averse; for though I can answer to some things which are objected to this doctrine, yet I seem not to be able to answer equally to the others. But if you can, you not only have enough already, from whence you may understand, with Littre, by what means air abounds in the blood, after large hemorrhages;

(*d*) De Medicina in præf.(*f*) Supra n^o 18.(*e*) De Mot. Animal. p. 2. Propos. 113.(*g*) Physiol. Med. l. 1. c. 4.

but perhaps also, from which to conjecture, how the same thing sometimes happens, even when those causes have not preceded.

28. For if those small orifices, through which air is to pass out from the blood, be by any means constring'd, or stopp'd up, the others continuing pervious, whose office it is to admit air into the blood, inasmuch as they are appendages of the pulmonary vein, and not of the pulmonary artery; you see, that immediately too great a quantity of air will be collected in the blood; and you see also, how near Thomas Bartholin (*b*) came to this conjecture, when he wrote, that through this artery, "in bodies that were found, "recrementitious matter was discharg'd in expiration, which is nothing else "but the aerial particles excited in the blood of the heart, and the other "parts of the body;" (or, as he had said before, "nothing but the air and "superfluous status of the crude blood) from whence also the status, that "was troublesome in the veins, according to Hippocrates and Galen; which, "if not evacuated by the common fan of the body, not only bring on various painful symptoms, but even, if they stagnate, may cause a rupture "of the veins, or raise the whole body into a tumour." And Plato (*i*) also, seems not only to have touch'd upon the whole of this hypothesis, but that likewise which I shall afterwards subjoin: and I am not sorry to quote his own words on the occasion. For he says, "When the lungs, the guard, "and as it were store-keeper of breath itself, being obstructed by defluxion, "has not its vents free and open; and on one hand, no air is discharg'd; "and on the other, more than is necessary, is receiv'd; then those parts, "which want respiration and cooling, wither away. But that which is received over and above, being carried through the veins, tortures them, "and mretles down the body." And a little after: "Air is often generated, "even within the body, when the flesh is flabby and rarefied; which, as it "cannot get forth, gives the same pains as air would that came in from "without. But it then gives most excruciating pains, when it inflates and "distends the nerves and veins that lie round it."

29. But as all these explications, and those of a like nature, may perhaps have place given them, on different occasions, at other times, so I fear they claim no place in the histories which I have describ'd; as in these the blood had been neither too dense, nor too slowly circulated, nor previously diminished; nor any mark of the orifices of air in the lungs being shut up, or constring'd, had preceded. Yet signs of a vitiated concoction, or, if you would rather have it so, of that solution which is made in the stomach and intestines, had preceded: for the Æthiopian had been subject to a languor of his stomach, and the fisherman to stultent disorders of the belly. Is it possible then, that from the food being ill-digested, bubbles of air coming forth in greater quantity than natural, for the reason pointed out by Brunnerus (*k*), or any other, and mix'd with the chyle, should have gradually dilated the orifices of the lacteal vessels; so that at length, a great number being form'd, as it were, into a phalanx, broke in altogether upon the blood, together with the chyle? Or shall we rather believe, that because these bubbles, being thus extricated and set at liberty, might have obstructed their own passage

(*b*) Diatrib. de Pulm. subst. S. 2.

(*i*) in Timæo.

(*k*) Gland. Duoden. c. 10.

in those veins, and prohibited all access through the streights of the mesenteric glands, as I said before, in regard to the sanguiferous vessels (*l*); shall we rather believe, I say, that they were intimately mix'd with the chyle, but in so much the greater number, as the matter which furnish'd out the chyle, was longer retain'd in the stomach and intestines, by reason of the weakness of these parts; and that thus they were brought into the circulation, and there at length began to expand and disentangle themselves, some unusual preternatural cause being necessary thereto? For why may not the same thing happen within the veins, which we frequently see happen without the body; that the same humour, being mix'd with any one liquor, emits no bubbles, but being mix'd with another, emits many? We see, in like manner, in regard to other juices out of the body, that while they are corrupted and putrefy, not less of bubbles than of stench proceeds from them. And how strong a smell came from the body of the fisherman, how many manifest signs of sudden corruption, and even of putrefaction, appear'd, the history of itself sufficiently shews. Certainly, under our very hands and eyes, particles of air began here and there to disengage themselves; certain bonds being, as it were, broken, which seem to confine them so long as the blood retains its nature. And it is possible, that some of these bonds may, before death, at some times, and in some places, begin to be sufficiently broken, in order to bring about this effect, if not entirely dissolv'd.

30. But in the Æthiopian, as there were more obscure marks of putrefaction only, so were there fewer bubbles, and none indeed that were conspicuous in any other vessels than those of the brain. And why in those vessels only? Was it because they could be more easily seen through the sides of these vessels than of others, as they are constructed of the thinnest coats of all the sanguiferous tubes? Or was it, rather, from some peculiar cause in them; for instance, from their great narrowness, which would be sufficient to retain even the smallest bubbles, and make them unite into larger ones; which by again joining themselves to others, would form still larger, become more conspicuous, and distend the neighbouring parts of the vessels? Or whether that happen'd by some accident, I shall not take upon me to affirm. But if you could have ask'd me that question formerly, when the doctrine of vapours was in common esteem, and the head was us'd to be compar'd with an alembic, it would have been very easy for me to have resolv'd it; and you, perhaps, by comparing it with what I had seen in the Æthiopian, would judge, that the case might be better interpreted according to the sounder doctrine of Avicenna (*m*); which is, "that a great pain of the head is brought on, by reason of the arteries bringing noxious vapours to the brain." And I now see, what you also may know from the Sepulchretum (*n*), that the learned man Brunnerus, to whom this same appearance happen'd, in some measure, before me, left it entirely unexplain'd. For whereas, in the bodies of two persons, and apoplectic persons too, he had found, at the sides of the brain of one, "the arteries very large, and almost empty, and the veins. "very large also, and distended with flatus;" and, in like manner, had found

(*l*) Supra n. 18.

(*m*) Canon. l. 3. Fen. 1. tr. 2. c. 1.

(*n*) l. 1. S. 2. in Additam. obs. 11. & 12.

in the other, "the veins that went into the longitudinal sinus containing air, "which he push'd backwards and forwards with the point of his finger;" yet in the scholia, which he subjoin'd to each dissection, although he spoke diffusely of other things, which he met with in them, he did not say a single word of this status: whether because other causes were not wanting in the brain, and more evident than this, to account for the apoplexy; or whether it seem'd to him, that it might be very easily explain'd from thence, why air should be in the neighb'ring vessels; or finally, whether he thought, that nothing was to be rashly attempted in a subject never agitated by any one before that time. I would not have you, therefore, believe me to be extremely audacious: for which reason, farewell.

LETTER the SIXTH.

Which treats of the remaining Soporific Disorders.

1. **Y**OU are pleas'd to tell me, that my last letter was the more agreeable to you, on account of the long disquisition which I made in regard to the quantity of air found in the blood; and I rejoice that I have been thus far obsequious to your pleasure. But I would have you at the same time observe, that if I go on at this rate with conjectures, and dwell thus long upon explications, I shall certainly not have room to communicate all the observations of Valsalva, and myself, relative to the remaining disorders. Yet this, you know, was my chief and original design in writing, and is also more worthy both of you and me. Let us, therefore, for the future, be more sparing in our conjectures, the evidences of which we cannot at the same time afford; and let us, if it be not disagreeable to you, dwell chiefly upon histories, the truth of which I can readily affirm. Yet I have but few observations which belong to the next section that follows (*a*) in the Sepulchretum, *De reliquis affectibus soporosis*; and none at all that belong to the two next sections after that (*b*), to wit, *De catalepsi, & de insomnia, & incubo*; under which heads there are very few observations even in the Sepulchretum. For the incubus, or night-mare, and the horrid dreams which usually attend it, not only happen very rarely, but are never mortal till they have degenerated into other disorders. And the catalepsy is still more rare; and, in short, all the other soporific disorders, except the apoplexy, though they often happen indeed, are nevertheless seldom alone, but join'd with other diseases, and especially with fevers. We shall probably, therefore, say more of soporific affections on other occasions; and we will even here produce those histories, in which though they were observ'd in some peculiar manner, yet they were generally attended with some other disorder before the patient fell a sacrifice thereto. And first, I shall give you five from Valsalva,

(*a*) L. 1, 3.

(*b*) 4, & 5.

four of which I found in his papers, and the fifth he formerly related to me, with which I will immediately begin.

2. Aloysio Ratta, brother to the senator of Bologna of that name, being a man advanc'd in years, and having been liable, for a long time past, to the hypochondriac affection, and vertigo, began, in the summer of the year 1705, to have an immoderate thirst; and in the month of November following, as far as I can remember, he was suddenly seiz'd with the disorder, which I shall describe in a few words. For a delirium was join'd to a good pulse, and, what was the chief symptom, a very great sleepiness. Of these disorders, in about two days, he died.

In the abdomen and thorax, when open'd, every thing appear'd sound; and although there was a smell of that kind, which is usual in those who have worms, that made some sneeze, and brought tears into the eyes of others, yet no worms were any where found. The skull being saw'd open, a gelatinous water lay among the convolutions of the brain: there was water also in the ventricles, and where the medulla oblongata descends into the tube of the spine; but in both places it was in small quantity only.

3. A fever of the worst kind seems to have been join'd with a comatose disorder; although the brain also, having been liable to long-continued indispositions, and for that reason less able to resist the cause of the disorder that was fallen upon it, might perhaps hasten his death. If worms, as well as the odour of them, had been any where found, then you would have a history in the Sepulchretum, which you might compare with this (*c*); for in that, a girl of nine years of age was taken off, even sooner than Valsalva's patient, by a soporific disorder, which had its origin from worms. And in the same place you will find Ballonius (*d*) asserting, that even men have been sometimes oppress'd with great drowsiness from the same cause. But let us now attend to a disorder, succeeding in like manner to a fever of the worst kind, which might have been refer'd to that species of disorder call'd carus.

4. A woman, aged five-and-twenty years, was seiz'd with a malignant fever, attended with deafness in the beginning. On the seventeenth day, a sleepy disorder came on, which became so heavy, that the patient neither open'd her eyes when she was spoken to, nor return'd the least answer to any one. After death, her brain was found to be entirely natural: only that it emitted a little quantity of serum through the infundibulum, when it was taken out from the cranium. But in the cavity of the tympanum, and the neighbouring sinuosities, was a sanious matter.

5. That Valsalva had frequently found, the deafness which came on in acute disorders to be attended with redundant water in the tympanum, I have said on a former occasion (*e*). But this began with the fever itself, and was from sanies. Moreover, that pus is sometimes form'd in the heads of lethargic patients, that doctrine of the ancients (*f*) seems to assert, which makes lethargy to consist in inflammation and imposthumation of the brain; and the observations set forth in the Sepulchretum (*g*) confirm. Among which,

(*c*) Sect. hac 3. obs. 42.

(*d*) In schol.

(*e*) Epist. Anat. 7. n. 6.

(*f*) Vid. apud Senert. Med. Præd. l. 1.

p. 2. c. 26.

(*g*) Sect. 3. cit. obs. 31, 33, 34.

when I read over one that gives the relation of a boy being dead from a soporific pain of the head, and of pus flowing out from the cavity of the skull, through the nostrils, after death; another history came into my mind, which Hippol. Franc. Albertini, a physician whom I am wont with great justice to praise, had inform'd me of. A parish-priest, after being long expos'd to the sun, for he liv'd in the country, was so far afflicted with a violent and continual double tertian fever, and with delirium, convulsions, and lethargy, which were soon after added thereto, that being given up by the physicians as desperate, he was suppos'd to be dying on the fourteenth day; yet on that very day, after a great discharge by urine and sweat, he was almost entirely freed from his fever. But Albertini, seeing that the lethargy still continu'd, and that the common disease of the whole body was subdu'd, but not the disease of the particular part, determin'd to attempt the removal of that also: for he suspected that there was an imposthume latent in the head, and that anteriorly, because the disorder had begun with a pain in the forehead. He, therefore, was bold enough, to use his own words, to attempt the rupture of the imposthume, by applying snuff to the nostrils of the patient, and calling upon him at the same time to draw in his breath strongly. By which means a sneezing was brought on, and a bloody pus in considerable quantity discharg'd from the nostrils: and the patient being purg'd by this way, was very well on the twenty-first day, except that he was subject to a vertigo, ringing of the ears, and other complaints of that kind; and continu'd so for some years. He was, however, living, and in good health, when this relation was made to me.

It were greatly to be wish'd, that the heads of those persons, upon whom such observations have been made, should after death fall into the hands of some diligent dissector, and one who should not be ignorant of what had preceded; in the manner it has been done sometimes, as I have shewn in the second letter to you (*b*): so that it might be evident, from ocular demonstration, that the pus had really come from the cavity of the cranium, and not from the pituitary sinusses. But to lay aside this wish, which we can very rarely put into execution, there are very few instances, among the great number of observations collected in the Sepulchretum, if you except the cases of wounded persons, which we are always suppos'd to do here, of pus being found in the cavity of the cranium after soporific disorders. We read that water, for the most part, was found; and this you will also remark in these observations of Valsalva, and mine, either in small quantity, as you saw in the examples above, or in large quantity, as you will see in the example which follows next.

6. A young man of fifteen, who was liable to a vertigo, fell suddenly on the ground, all sense and motion being suppress'd. An hour after, he came to himself, but the motion of his tongue was somewhat impair'd. A few days after this, he fell into an acute fever, which was follow'd by a soporific disorder, attended with slight convulsive motions: his face was red. At length he died. A great quantity of stagnating serum was found in the brain.

(*b*) N. 16.

7. To

7. To the great number of observations, that I said just now, were contain'd in the Sepulchretum, from various authors, of water being found in the brain, after soporific affections, others, which are extant, might be added. I will point out two, and no more; one from an ancient, and the other from a more modern anatomist. Jacobus Sylvius (*i*) says, that he "had seen in some, who had died of a carus or catoche, the ventricles of the brain entirely full of a ferous humour." And William Cheselden (*k*) asserts, that he had always found the brain full of water, in the dissection of lethargic patients.

8. A drinking man, near the age of sixty, who labour'd under an acute fever, being brought into the hospital only in the latter part of his disease, lay stupid, and answer'd nothing to those who ask'd him any questions. He frequently threw off the clothes, as if he were burnt with a great heat; yet, if you touch'd him, he felt scarcely warm, and in the extreme parts of his body was even cold. At some times no pulse could be perceiv'd; and sometimes again it rose higher; but was hard, small, and intermittent. Yet his respiration was natural. In this manner pass'd the latter days of his disease, and he died about the fourteenth. His abdomen and thorax being open'd, the stomach and intestines were found painted over with a slight redness, as if they had begun to be inflam'd; and in the ventricles of the heart was some thickish blood, but fluid. On opening the skull, cutting through the dura mater, and taking the brain out from the cranium, a little limpid serum came forth. Under the pia mater also, which bore marks of a slight inflammation, the furrows that go down betwixt the convolutions of the brain, were full of the same serum. Last of all, a little serum was found in the lateral ventricles, which was tinctur'd with the colour of blood.

9. This fever was a λειπυρία, as the remarks made on the living and the dead body signify. And if we set aside that inflammation observ'd in the stomach, intestines, and pia mater, which belongs particularly to the fever itself, and which seem'd more slight, according to my opinion, because it was ερυσιπελατώδης, of the erysipelatous kind; then the water will remain, whereto you may ascribe the stupor, which was so great, that he lay like one half-asleep, and made scarcely any answer to questions that were ask'd him. And frequent drunkenness had not only furnish'd sufficient matter for inflammation, but also, by weak'ning the brain, had dispos'd it to the secretion of that water. For which the foregoing frequent vertigo, and finally the apoplectic paroxysm, had prepar'd the young man of whom I spoke of above.

10. A man of sixty years of age was seiz'd with a pain in the left part of his thorax: he lay on his back. About the tenth day a soporific disorder came on, by which all the internal senses were entirely destroy'd: he even scarce mov'd himself; and when he did, it was slowly and heavily. His feet were violently pinch'd, yet he did not discover the least feeling. At length he died.

In the thorax, the left lobe of the lungs was indurated. In the right ventricle of the heart was a polypous concretion. Within the cranium, about the vessels that creep through the dura mater, was the beginning of a

(i) Calumn. Depulif. 28.

(k) The Anat. of the hum. body, book 3. ch. 14.

gelatinous concretion: and in the ventricles of the brain a little serum was found.

11. The pain of the thorax, and indurated lungs, shew an inflammation thereof. The remaining appearances shew the most grievous veternus, or lethargy, which degenerated into an apoplexy; and this into death. And how easily a veternus and inflammation of the lungs may be join'd together, you will gather from Hippocrates, Ballonius, and others, whom you will see commended, on occasion of observations of this kind (*l*), in the Sepulchretum (*m*). And to the same effect are those two of my own, which I shall immediately subjoin to the five already describ'd from Valsalva; besides one, which is to be written to you at another time (*n*).

12. An old man, who was seventy years of age within one, of a pallid complexion, and had complain'd, for some time, of a slight pain in his neck; was, by reason of the encrease thereof, receiv'd into the hospital of St. Mary de Morie, at Bologna. He was very weak, his pulse small and frequent. And though he had, in other respects, his senses about him, so that he saw and heard well, yet he was slow to understand, or to act, like one that was half-asleep. And this one symptom continu'd through the whole of the disease, and even encreas'd; whereas the others, and among these the pain of the neck, had very soon remitted. But after some days, he complain'd of a pain in his breast, which had attack'd him in the night; and pointed out the seat of it, by touching the sternum with his hand. For this reason, a few ounces of blood were immediately taken away from the hand, and those things applied inwardly, and outwardly, besides, which are us'd in an incipient inflammation of the breast. After this, the pain left him within a day; so that he never complain'd of this, or any other inconvenience in his thorax again. But upon the pain leaving him, a stertor succeeded, with a rattling of phlegm in the aspera arteria, which lasted two days; and the pulse, in the mean while, was become very faltering; yet upon being examin'd very often, and very particularly; whether he felt any thing painful or troublesome to him, and where, he made no answers, but such from whence you might gather, that his head seem'd heavy to him, and that he had, besides this, an internal pricking at the right temple. In the mean time, though the stertor was gone off, and he was at freedom to lye on either side, notwithstanding he lay generally on the right; and finally, though the faltering of the pulse was abated; yet this state of things did not please us; and that with reason. For on the fourth or fifth day after the pain had gone off, which was about the middle of January, in the year 1706, he was found, in the morning, to be still more stupid, and more like one half-asleep; with his pulse weak, and his strength decreas'd: and on the following night, after having taken his supper as usual, he very soon fetch'd a deep sigh, immediately began to expire, as it were, and within an hour died.

The abdomen being open'd, we found the liver white, and somewhat hard, and its bladder distended with a large quantity of bile; the stomach was plac'd lower than usual, but sound. The right cavity of the thorax had a

(*l*) Sect. hac 3. obs. 39. 48. & in Addit. obs. 4.

(*m*) In Schol. ad cit. obs. 39.

(*n*) Epist. 21. n. 23.

pretty large quantity of serum in it, turbid, and partly, as it were, sanious; and the left contain'd a little also, but bloody. The left lobe of the lungs was connect'd laterally here and there, by membranes, to the pleura; and in its upper part, had a hard portion on its surface, which seem'd to be an old disorder: as to other things, it was moderately distended with air; and if you cut into its substance, pour'd out a frothy humour, which might possibly have been squeez'd out from the right lobe by the bronchia; inasmuch as the substance of this lobe was become very hard, and compact, as you will immediately understand. For at its upper part, where it also adher'd to the pleura, it seem'd corrupted; but in the remaining part, which was much the greater part of its substance, it was very hard, extremely swell'd, and felt very heavy, if you rais'd it with your hand. Externally, it was of a fleshy colour. And internally, wherever you cut it, it seem'd to be made up of fleshy particles cluster'd together, like so many globules, the vessels on both sides being more black and distinct than usual, from the quantity of blood included in them: therefore, the uppermost part of the upper lobe, by reason of its vessels being in greatest number, was entirely black. But a large quantity of putrid humour came out from this right lobe of the lungs, when it was cut into.

From the four orifices of the heart began so many polypous concretions, being produc'd from thence into the trunks of the corresponding vessels, and into the branches of those trunks also, as we certainly saw in the pulmonary artery and vein. Those two were the largest of them, which were carried into the veins close to each auricle; and they even expanded themselves into the auricles, but especially into the right. They were all compos'd, in great part, of a white, tenacious, and, as it were, fibrous substance. The skull being open'd, a slender, polypous concretion, but of the same substance with the former, was seen in the sinus of the falx. Betwixt the two meninges was a pretty large quantity of water. There was a good deal in the furrows of the brain, under the pia mater; and even, as I learn'd by attentive inspection, within the very membranous substance of the last-mention'd covering of the brain; and the fluid was separated into a kind of mucous cells, as it were; so that I observ'd it to have the appearance of a gelatinous consistence, though it was really fluid. In the lateral ventricles, was a little bloody water; yet the vessels, which ran through their surface, were not pallid, nor those of which the plexus choroides are compos'd: nevertheless, in the posterior part of these plexusses, were hydatids. The pineal gland, which was by no means lax, had within it a little unequal body, of the bigness of a small pepper-corn, and of a hardish substance, but neither bony, cartilaginous, nor manifestly stony. The cerebrum and nerves were not very flaccid, and the cerebellum seem'd somewhat pale. From the tube of the spine just a few drops of water flow'd down.

13. If it were allowable to pick out some things from the words of Hippocrates, as if from oracles, and accommodate them to our subject in question, certainly out of those things which he wrote concerning lethargic patients (e), these would agree very well with the history propos'd: *Soparati, decolores,*---

(e) In Cœac. Prænot. Dureto interpr. l. 1. n. 145.

cum pulsa sepulto, --- cervicis dolore angī querantur---Quicunque servantur, fere parvulenti redduntur : or, "Slēpy, pallid,---with a very low, weak pulse.---" They complain, that they are tortur'd with a pain in the neck.---Those "who escape have generally a suppuration." That is, as Duretus interprets, the paffage, "they have a vomica, or abscess, of the lungs, unless they are" previously taken off by a peripneumony, arising from the descent of this "corrupt matter, the strength being already destroy'd by the lethargy." But whatever we are to think of these things, and especially of that descent of corrupt matter, without doubt, the old man, whose history I have related, perish'd at the same time from the peripneumony, and from his strength being impair'd by the soporific disorder. For the lungs really become tumid, dense, hard, and heavy, in this manner, from a peripneumony, which cannot be resolv'd ; as I shall shew at large on future occasions (p). Wherefore, in the last history of Valsalva, I took it for granted, that the lungs had been inflam'd, from one of its lobes being found indurated, after pains in the breast (q). And an inflammation of this kind could not be resolv'd in a weak old man, who lay half-asleep, as he was neither able to discharge the matter while it lay moveable and rattling in the bronchia, nor even so much as endeavour'd to do it. Therefore, though the pain first went off, and soon after the stertor, yet we did not suffer ourselves to be flatter'd therewith ; as we conjectur'd, how much mischief might certainly lurk under that appearance of quiet. And this mischief was so much the more encreas'd, because there was much matter in his impoverish'd blood, which was prone to concretion, when at rest ; as the polypi found after death, which were so large, and in so great number, evidently prove.

But that kind of mucous appearance, under the pia mater, is not to be accounted for from concretion ; because, although it appear'd to be a jelly, yet it was actually fluid water ; and whatever appearance of mucus there was, arose from the fibres and particles of the membrane being divided and torn asunder. And I doubt not but this appearance has sometimes impos'd upon me, and upon others ; although Wepfer ought to have given us some suspicion of it, who has more than once (r) remark'd, that when he had seen, in the same place, "a jelly, upon pricking it with his knife, water flow'd out." It is true, he did not observe from whence that appearance proceeded. Nor was I solicitous about its true situation, when I found out from whence it proceeded : which ingenuous confession I judg'd it was proper to make to you here, that whenever I say in these letters, that I found water under the pia mater, or mention this membrane in those places where nature has not disjoin'd the tunica arachnoides from it, you may always understand, that both of these membranes are comprehended under one and the same name, after the manner of the ancients ; and that calling to mind the great number of "fibrous connexions," by which Ruysch (s) has taught that they were both naturally join'd betwixt themselves, you may with the later anatomists suppose, that water was collected in the interstices of these relax'd connexions. But the old man we speak of, had this great quantity of water within the

(p) Epist. 20 & 21.

(q) Supra, n. 11.

(r) Sepulchr. l. 1. c. 2. obs. 47. & l. 15. obs. 3.

(s) Responf. ad Epist. problem. 9.

cranium, because his blood, being of the nature describ'd, circulated slowly; and also because, at that age, the constitution abounds with serum, and the head is more infirm, as the debilitated habit proves. What we read, therefore, in one of the books that goes under the name of Hippocrates, entitled, *De hominis structura* (1), "When the brain is fill'd with cold humours, hence "the disorder call'd lethargy is brought on," if taken in a somewhat lax sense, you see confirm'd by this, and the other dissections given you in this letter; and in two others besides, that relate to soporific affections, the observations of which are inserted in the first (u) and second (x) of these letters. And you will, perhaps, see it-confirm'd in others also; as certainly in that which I now go on to describe to you, since I have already said what I had to say, concerning hard corpuscles in the pineal gland not very rarely occurring, in the preceding letter (y).

14. A man, who was a foreigner, and to appearance about fifty years of age, died, in the hospital at Padua, of an inflammation in the lungs, which had been join'd for four days with a soporific disorder. This was in the month of March, of the year 1717. The celebrated men, who were at that time my assistants in most of my dissections, but afterwards deservedly chosen into the number of public professors, Julio Pontedera, and John Baptist Vulpus, took care, according to custom, that those parts should be brought to me which I wanted; and at that time I was accidentally enquiring into some things relating to the structure of the head, and the parts of generation. Neither they nor I were at that time solicitous about the viscera of the thorax, because there was a very manifest inflammation of the lungs. From the genitals, it was easy to discover, as you will know from the peculiarities they had, which are describ'd by me in another place, to be produc'd on a future occasion, that the pleasure of venery had never been known to this man. And in the brain, though my enquiry was of another nature, I nevertheless observ'd the appearances which relate to the present occasion: for there was water in the ventricles, as also here and there under the pia mater, in great quantity, and of a yellow colour. And up and down in the vessels, which were distended with blood, polypous concretions were found.

15. In the cranium of this man also, you see, as I said before, there was water contain'd. But this was yellow; as also in the comatose girl; in the taylor, whom a deep sleep now and then seiz'd; and in the lethargic boy; whose dissections you have in the Sepulchretum (z). Do not, however, for that reason, hastily reject what is quoted there on the occasion, from Carolus Pifo (a), that the serum of the blood "is soporific, if it be mix'd with the "recrementitious mucus of the brain, or with any other of the humours, "except bile." For in that girl, an epileptic fit had preceded, and in the boy, a great pain of the head; and the taylor had not only the same pain, but was also alternately troubl'd with intense watchings, and oppressive sleep: nor was perhaps any thing of this kind wanting in the man whose history I have given, if any one would have diligently enquir'd into it. Nor yet am

(1) N. 3.

(x) N. 20.

(y) N. 12.

(u) N. 2.

(z) Sect. hac 3. obs. 12. & 43. & in Addit. obs. 1.

(a) Sect. ead. obs. 8. in Schol.

I ignorant, that it is related in the same volume (*b*), from Franciscus Sylvius, that in the bile itself, which is, like opium, exceedingly bitter, “a strong narcotic quality” is plac’d; and that other circumstances of disease beside water, but especially vessels distended with blood, are not rarely found in the heads of lethargic persons; and even in some (*c*), “that the brain is found entirely free from any dropsy, or serous colluvies, with which lethargic patients are generally affected.” Nor do I deny any of these things; but, on the contrary, add what I have heard, that in dogs who were made sleepy from swallowing opium, all the arterial vessels of the brain appear’d to be exceedingly turgid with blood. Yet this I say, it is useful to know, that soporific affections are brought on in others differently, and from a different cause; but that it is still more useful to know, what is “for the most part” wont to be found after such disorders, even from the confession of others.

16. But now, since we have treated sufficiently of serum, which is for the most part found, let me also say something of the distension of the vessels, (which I myself judg’d to be the case in that soporific disorder, wherein I order’d the occipital veins to be open’d, with great success (*d*), and I confess that it is frequently found, together with water, as the *Acta Cæsareæ Academiæ* also (*e*), and other observations of ours (*f*), confirm); let me, I say, speak a little of that subject, especially as this distension was not wanting in the man, whose history I am considering. I believe that the larger quantity of blood he had in his body, and the less it could be circulated through the inflam’d lungs, the more of it must have remain’d in the veins of the brain, and have stagnated there. For these veins have not the assistance of muscles, lying round them, and receive their blood from arteries, which being made up of very slender coats, are not able to press on strongly the circulating fluid, nor to apply great force, in order to impel it from behind. And the more the blood is delay’d in its progress, so much the more serum, if nothing prevents, is separated from it, and so much the more is the brain oppress’d from both causes; moreover, the greater this oppression is, the more heavy is the sleep; so that as the oppression is still more encreas’d, this sleep degenerates into an apoplexy. Senertus (*g*), therefore, admonishes us, that if a carus is so much encreas’d as to hurt respiration, “an apoplexy is then at hand.” And even Boerhaave (*h*) expressly says, that a carus is a slight apoplexy, and a lethargy a slighter species of apoplexy; which I take notice of, that you may not wonder to see me acknowledge any thing to be the cause of soporific disorders, which I before laid down among the causes of apoplexy. But why the same causes seem sometimes to be greater in the heads of those who died of these disorders, than in others, who were taken off by apoplexies, you will sufficiently conjecture of yourself, from what has been said in the fourth letter (*i*). And I am not willing, as I have said, to indulge conjectures in a very prolix manner here. In the mean while, you will take all in good part, as a friend. Farewel.

(*b*) Ibid. in Schol. ad obs. 13.

(*c*) Obs. 30.

(*d*) Advers. 6. Anim. 83.

(*e*) Vol. I. obs. 152. & IV. obs. 39.

(*f*) Epist. 10. n. 17.

(*g*) Medic. Pract. l. 1. p. 2. c. 32.

(*h*) Aphor. de cognof. morbis § 1045 & 1049.

(*i*) n. 31.

LETTER the SEVENTH.

Which treats of the Phrenitis, Paraphrenitis, and
Delirium.

1. **W**H Y I must pass over the two sections which follow the “soporific affections” in the Sepulchretum, you easily understand, from those reasons that I hinted at in the beginning of the former letter. And I have nearly the same reasons for passing over the section which succeeds those two, entitled, *De vigiliis præter naturam*. For these preternatural watchings, also, are not alone when they are mortal, but are join’d with some other, and more violent disorders. You will, therefore, find no example, where watchings were the only symptoms, among all those that are there produc’d: which, however, are eight in number, and no more; and, indeed, not so many as eight, for the seventh observation is the same as the fourth. And I wonder more at this one not being observ’d within so few lines of the other, than I do at the numerous repetitions which are made in the following seventh section; for the thirty-fifth observation is no other than the thirty-third, nor the thirty-fourth than the thirty-ninth. And I could wish, that in the three preceding sections, the same carelessness was not obvious. Certainly, in the first, it might have been easily observ’d, that the thirty-second observation did not differ from the sixteenth, nor the thirty-fourth from the nineteenth, nor the sixty-third from the thirty-fifth, nor the eighty-fifth from the forty-fourth, nor the hundred-and-third from the ninety-fifth. Nor, in the second section, the twenty-eighth from the twenty-fourth, or twenty-second, or from the second in the Additamenta. Nor, in the third section, the twenty-third observation from the twentieth, or the thirty-eighth from the forty-fourth. And if these have occur’d to me, who was upon another enquiry, it is natural to suppose, that they who would look diligently after them, would find many more. However, these things, and many others of that kind, will be seen by those, who shall publish a third edition of these books. But, that we may return to our purpose, I now pass on to the seventh section, which I said follow’d these, putting off the examples of watchings, and other disorders. That section is entitled, *De phrenitide, paraphrenitide, & delirio*. And I find, in the papers of Valsalva, these four histories particularly taken notice of, which are relative thereto.

2. A young man, about twenty years of age, lay ill in the hospital of Saint Mary de Morte, at Bologna. He had a slow fever, with a thirst; yet his urine and pulse were very much like those of persons in health: so that the disorder seem’d but slight. Yet about the eighth day, a violent delirium came on, which lasted seven days. And when this ceas’d, the patient lay almost as if he were without any sense, unless that he seem’d to be a little rous’d at some particular times. At length he died.

The carcase, on its out-side, even inclin'd a little to lividness, especially under the nails of his hands; and the muscular flesh was rather of a brownish colour, than of its native red. The blood was also blackish, and very thick, but still fluid. In the belly and thorax all the parts were sound, except that there were no traces of water in the pericardium. The cranium being saw'd through, and rais'd up, a kind of gelatinous concretion was observ'd, which lay on the sides of the sanguiferous vessels that ran through the pia mater. And this membrane being torn at the basis of the brain, a quantity of water issu'd forth, in colour and thickness resembling the whey of cow's milk. But the whole brain was found.

3. This fever was a malignant one, as it is call'd; and it is manifest, that the delirium which was added to it, was a phrenitis. But why was there no inflammation in the meninges? no distension in the vessels? Will you believe, that the inflammation was dissolv'd, when the phrenitis was chang'd into a stupor; but that it was not wanting before, and at the same time that this quantity of water was secreted? Be this as it will, you will not meet with any mention of distension of vessels in the meninges, in the two next observations.

4. A man, about five-and-thirty years of age, was seiz'd with a pain in the breast, and with a fever. His pain going off, a delirium was added to the fever; which, as the fever was continually becoming more violent, lasted till death came on. This happen'd about the eleventh day. The thorax being open'd, the back parts of the lungs were found a little hard and red. In both the ventricles of the heart was found a polypous concretion, but in the left somewhat larger than in the right; which Valsalva wonder'd at, because he had always observ'd the larger to be in the right, till that time. While the brain was taken out of the cranium, a little serum flow'd out from the meninges. In each of the large sinusses of the dura mater, was a polypous concretion. The whole brain was soft; and in its left ventricle, the plexus choroides was very turgid, like varices.

5. This is not a proper place to speak of the causes and differences of polypous concretions. But that cause, which gave rise to an incipient peripneumony, seem'd in this man to have been translated to the head, and remain'd there till his death; and it would naturally be suppos'd, that it should have brought on a conspicuous inflammation of the meninges. Yet it had not done it; and that kind of varices, in one plexus choroides only, was certainly a disorder of long standing.

6. A porter, labouring under an ardent fever, was afflicted with a violent pain in his head, to which a delirium succeeded. After death, a little serum was found betwixt the two meninges, part of which had concreted among the sanguiferous vessels, after the manner of a jelly; and in the sinus of the falx, was a thin and long concretion. But the whole brain was perfectly natural.

7. And a man, of five-and-thirty years of age, fell ill of a bad fever: he was delirious; his eyes glistn'd; his pulse was vehement. At length he died. The brain was in a good state; but the blood-vessels thereof were turgid with blood, and the ventricles contain'd a little serum. But, except some polypous concretions in the heart, all the blood in this body was fluid.

8. Do not be surpris'd, that, except this one, Valsalva did not see the vessels of the brain distended in any of these delirious persons, whose dissections he gives. If you read over again all the examples of delirious persons, which I related from him in the former letters (*a*); for the delirium also is in the number of those affections, which, though they may sometimes, even if disjoin'd from other more grievous disorders, prove mortal, yet they more frequently are join'd with others; I say, read over these examples, and you will find none in which he remark'd a distension of the vessels of the brain, but many in which water was found. This, however, is indeed true, that those deliria were not, for the most part, such as are suppos'd to have an inflammation of the meninges conjoin'd. But yet there are some observations extant in the Sepulchretum (*b*), in which, though it was very probable, yet there was in fact no true inflammation; and if the vessels were distended, "they were turgid with a watry and pituitous blood." And the dissections and opinion of Willis are produc'd (*c*), who thinks, that soporific disorders are rather brought on by inflammation of the meninges, than a phrenitis, the brain being compress'd by the obstructed blood; or if an inflammation of that kind be found after a phrenitis, that it is then found, when a phrenitis is at length chang'd into a carus, or lethargy. On the contrary, in most of those observations, which are related of phrenitic or delirious patients, in this section of the Sepulchretum, you will see, that an inflammation of the meninges, or at least a distension of their vessels, is spoken of, though they had not been seiz'd with a sleepiness before death. There are, indeed, learned men, who follow Willis so far as to acknowledge, that a phrenitis is not always brought on from an inflammation of the meninges; but they think it cannot be denied, that the brain, or at least the cortical substance of it, is always inflam'd in a phrenitis. Yet this was expressly denied by that excellent anatomist Henricus Meibomius, when he lay'd down this position (*d*), "In a phrenitis the substance of the brain itself is not inflam'd." But I not only do not deny, that it is sometimes inflam'd, but can add some observations thereof to those which are already contain'd in the Sepulchretum; as that of Lanzonus (*e*), who in a young man that had been delirious, in a malignant fever, found "the brain every where sprinkled over with red spots, and the membranes livid," which were no obscure marks of a foregoing inflammation; and that of Moglingius (*f*), who saw the "cerebrum, with its membranes, every where inflam'd, and in some measure sphacelated, and the ventricles fill'd with serum." But after having added these, and other observations, I must not conceal the great number in which no inflammation was any where found in the brain; of which kind, not to depart from the Sepulchretum, almost all those are, that are brought to shew, that in a phrenitis there was no inflammation of the meninges. And amongst them, I would have you particularly attend to that, in which the excellent anatomist Coiterus (*g*) says, "I could find no inflammation, neither in the membranes,

(*a*) I. n. 2. & 4. V. n. 2. & 4. VI. n. 2.

(*b*) Ex gr. 13, 14, 16. hujus sept. sect.

(*c*) Ibid. obs. 1. cum Schol.

(*d*) Coroll. 4. in calce Exercit. de Observ. rariqib.

(*e*) Eph. N. C. dec. 3. a. 9. obs. 113.

(*f*) Earund. cent. 6. obs. 22.

(*g*) Sect. hac 7. Sepulch. obs. 16.

“nor in the substance of the brain:” and subjoin to this, what another skilful dissector has observ’d, which should be read rather in the words of Rhodius (*h*) himself, than in the Sepulchretum. For Rhodius, when he had already related one dissection of a phrenetic person, in whom he had found an inflammation of the meninges and brain; adds, “But Fabricius Bartoletus, a diligent and ingenuous man, confess’d to me, that he had found, “in the bodies of many persons who died phrenetic, the pia mater inflam’d, “without the least disorder in the brain.” But if you should not be very ready to believe, that the cortical part of the brain, at least, did not contract some injury from the contiguous meninges; yet take care how you imagine, that when the cortical substance of the brain is inflam’d, a phrenitis is always the consequence. For the same Willis, who very often saw that a phrenitis was absent when the meninges were inflam’d, has taught, in the same place (*i*), that it was even absent “sometimes, when he found the “external circumference of the brain beset with an inflammatory tumour.” Nor are other observations wanting to confirm this; and among the rest, that which is extant in the fourth book of the Sepulchretum (*k*); for “the pia “mater was itself red, and under it was a pus somewhat thick and red; yet “the patient had not been at all delirious.” How is it then? When you have attended to all that is said, you must come back to this conclusion, at last, that the causes of these deliria seem to be different at different times, and those according to the various nature of the blood, humours, or the affected part of the brain; or from the original constitution, and foregoing disorders thereof, or from other things of that kind; or from the various conjunction, sometimes of many of these circumstances, sometimes of all, acting differently in different persons, so as to produce one disorder at one time, and another at another. There will be, for that reason, in some, an inflammation of the brain, in many an inflammation of the meninges, or at least that distension of the vessels, but not so as to compress more than to irritate. In others, water is extravasated, but this is irritating also; for I agree with Bonetus (*l*), or any other person who asserts, “that pure unmixed “serum without acrimony is not able to excite a delirium.” Finally, in many, to omit other causes, there will be a conjunction of all those that I have just now enumerated. To which purpose also, are some observations that are to be seen in the Sepulchretum (*m*), and many of mine, some of which I have already written to you (*n*), or am to write in other letters; and five of them I will immediately subjoin in this.

9. An old man, in his eightieth year, being admitted into the hospital of St. Mary de Morte, at Bologna, for various, but slight indispositions; while he was there, his pulse not only became more quick and frequent, but also more turgid, than seem’d suitable to his age. He also began to be delirious, and often to tremble in his lower jaw, and limbs, as if from a convulsion. Then being question’d, what complaints he had in his head, he said expressly, that he perceiv’d a weight, and nothing else. Moreover, when his delirium had

(*h*) Cent. 1. Obs. Med. 40.

(*i*) Obs. 1. c. t.

(*k*) Sect. 3. obs. 10. § 7.

(*l*) Sect. hac 7. l. 1. in Schol. ad obs. 27.

(*m*) Sect. ead. obs. 16 & in Addit. obs. 1.

(*n*) I. n. 14.

continu’d,

continu'd, and he had trembled, in the manner I have said, for fifteen or sixteen days; his pulse, at length, which had been observ'd to be lower sometimes before, became very low; and within two days, from that time, a stertor coming on, he ceas'd to be delirious and to live at the same time. The belly and chest being open'd, fourteen hours after death, the viscera were even at that time warm, although, for the whole space of time, the body had been expos'd to the open air, and in the cold, as it was then about the beginning of the year 1706. The intestines, where they touch'd one another, and on their inferior surface also, were a little red; but the edge of the liver was livid: last of all, a great part of the membrane, which cover'd the convex surface of the flaccid spleen, was become very thick, and hard like a cartilage. These were the appearances in the belly.

And in the chest, the right lobe of the lungs coher'd with the pleura, on its inferior side; and on its upper part, it had a kind of hard portion, in which, when dissected, all the vessels of the lungs seem'd obstructed and dried: so that I should believe it was a disorder of long standing. And the inferior, and especially the posterior, parts of the lungs, were not only black, as they generally are, but somewhat hard also. The pericardium contain'd scarcely any water; and the heart had two polypous concretions therein; one in the right ventricle, that was yellowish, and viscid; which, in the auricle, and near the orifice of the pulmonary artery, where however it did not enter, became white, and somewhat hard; and another, white and hard, in the right ventricle, and the beginning of the great artery. The valves also of the aorta, and the mitrales, were here and there hard, yet not bony. But the trunk of this artery, if you look'd on it externally, as it goes down upon the vertebræ, shew'd the sanguiferous vessels, which run upon its coats, to be much distended with blood. And if you look'd upon its internal surface, it had here and there hardish little scales, and was even already bony in many places, and that where the trunk of it went down into the abdomen, and in a superior branch thereof: but these were less hard near the heart. Besides, between the scales, in some places, the internal coat was wanting, and the next coat seem'd also to be there ulcerated, corroded, and converted into little bits of red, putrid substance, which were prominent in the cavity.

As we were about to open the cranium, while we mov'd the temporal muscles, we observ'd them to be extremely thin and slender, I suppose, because they had for a long time past been unus'd to any strong action, in an old man who was almost toothless. But while the head was sever'd from the top of the spine, a little water flow'd out of the tube of the vertebræ, and a large quantity from the great foramen of the os occipitis. And for this reason the dura mater was presently found to be much corrugated. Yet under the pia mater, in the convoluted furrows of the brain, a water remain'd, much like that in which fresh meat has been wash'd; and some portion of the same kind of water was found in the lateral ventricles; yet the vessels contain'd therein were not pale. Moreover, I saw many vessels in the pia mater, loaded with a black and coagulated blood; and in the sinus of the falx a long, slender, polypous concretion. However, although the cranium and the brain of this man had I know not what kind of disagreeable odour;
yet

yet the substance of both cerebrum and cerebellum was found: except that the first was a little lax, and the latter exceedingly so.

10. You see, that notwithstanding this man was so old, as to have the aorta here and there become ossified; and that in a delirium perpetual, indeed, but not fierce, there was a distension of the vessels in the pia mater, together with water. But let us go from this, where I purposely began, to another old man, not so far advanc'd, who had a more violent delirium; as we shall have a more convenient opportunity of considering the appearances in the body of the former on a future occasion.

11. A pottor of seventy years of age, by nature chearful, and a great drinker, after anxieties of mind, and fatigues of body in his business, greater than usual, and more than his age could bear, fell into a fever, and at the same time had a violent pain of his left side. Wherefore, about the fifth of April, of the same year, 1706, he was immediately receiv'd into the hospital above mention'd, and blood was immediately taken from his left arm. On the fourth day, the fever was very much encreas'd. And on the sixth, the delirium came on in such a manner, that it was necessary to bind him down, to prevent him leaping out of bed. His pulse was quick, but equal; his respiration difficult; and he had no expectoration. Therefore, although he lost blood on that day from his foot, yet every thing growing worse, on the day following he had a stertor; thus lying supinely, and being moist with sweat over his whole body, he died.

The face of the carcase, the shoulders, and arms, were yellow, just as in jaundic'd persons; and the other parts likewise, but less so; and the ilia were somewhat livid. The belly being open'd, we observ'd the omentum was very short, and drawn upwards; and the coat of the spleen, where it invested the lower part of the gibbous surface, was very hard; but the liver was connected by its whole convex surface to the diaphragm, except its edge, and the parts about it. This edge was livid to some extent; and the greatest part of the hollow surface, together with the substance that was nearest to it, to the depth of two lines: the remainder thereof was pallid, and variegated like marble, and the whole of the viscus was somewhat hard. The bile in the bladder was in small quantity, and like corrupted blood, or turbid water in which meat has been wash'd. There was no obstruction to its descent into the duodenum; and that it had descended, the colour of the intestinal contents evidently prov'd. The intestines were turgid with air, and a yellow fat adher'd to them: there was also a little quantity of water about them, in the lower part of the pelvis. And that part of the small intestines which lay in the pelvis, was a little reddish in its colour, and inclining to brown; as also the neighbouring portion of the ureters. But the urinary bladder, and the urine, with which we found it distended, were both yellow; and the sanguiferous vessels, towards the cervix, both in its posterior and interior part, were turgid. In the sides of this bladder it was that I saw those cells and herniæ, as it were, which are describ'd in the *Adversaria* (e), not without a conjecture at their causes; for which reason there is no necessity

for their being describ'd again here; especially as you may see many more of them delineated by my very good and experienc'd friend Heister (*p*). I will, however, add this one thing: that having taken care to enquire of the intimate acquaintance and domesticks of this potter, whether they knew he had been ever us'd to complain of any disorder in his bladder, they said expressly that he had not; and the same of the hernia varicosa; which appear'd to me in this manner. A great number of veins, dilated and thicken'd, embrac'd the testicle all round, the substance of which was so compact, that it could not be resolv'd into slender tubes, as it is in general very easy to do. There was, besides, beneath the testis, a small bony body. All these things were comprehended in the tunica vaginalis, which was grown to the testicle all round, unless on the upper part, where there were two vessels full of yellow water. The tunica vaginalis was also incorporated with the other testicle, except where the body of the epididymis came between, and prevented it; for in that place was a cavity which was fill'd with water of the same kind. Turning then our eyes to the penis, neither in the glans, nor in the præputium, did we observe any thing of the frænum; or at least, there was only a white mark, where the frænum should have been, or where it formerly was. We slit the urethra quite up from beginning to end, but saw nothing worthy of observation, except a few small granules of concreted mucus, that look'd like the powder of tobacco; which were on each side of the feminal caruncle, and the caruncles themselves seem'd, as it were, to be glew'd down to the urethra. Then the prostate gland being dissected, I found, wherever I cut into its substance, the same kind of granules like tobacco, in the left side as well as in the right; but still more in the right side than in the left.

Coming now to the thorax, the first things that occur'd to us were the cartilages, by which the inferior true ribs are join'd with the sternum, protuberating outwards from the right side, as if there had been something within which had forc'd them outwards. But there was nothing of this kind; therefore I conjectur'd, that this appearance was to be ascrib'd to the too great action of the right pectoral muscle, in his puerile state, and to the violent exertions which the initiating into his art, perhaps, requir'd. In the right cavity of the thorax, when laid open, every thing was found: but in the left was a considerable quantity of yellowish water, which being exhausted, there appear'd, strew'd over the surface of the lungs, pieces of a kind of thick, and as it seem'd, yellow, and easily lacerable, membrane; so that though it resembled a reticular kind of texture, I nevertheless judg'd it to be no more than a concretion of the grosser particles, which swam in that yellow water. And there were large portions of the same kind, especially throughout the inferior surface of the inferior lobe of the lungs, and betwixt one lobe and the other. But that inferior lobe was almost universally hard, and heavy; and being cut into, was found compacted of a thick substance, not as the lungs generally are, but like that of the liver: so that though I should say nothing on the subject, yet from what I deliver'd in the preceding letter (*q*), you would understand, that it was affected with a peripneumony. And

(*p*) Infit. Chirurg. Tab. 32. Fig. 1 & 2.

(*q*) n. 12 & 13.

the inflammation seem'd to have begun to pass over into a suppuration : for the substance of it was white, not red ; and a thick white matter was here and there press'd out from certain orifices, which I suppose were openings that we had cut into the bronchia. But the superior lobe, in its upper part, being turgid with frothy blood, was also black and hard ; and so very hard, that you would think it rather a disorder of long standing, than a recent one. In the remaining part, however, it was free from moisture, and nearly resembled the lungs of a sound person : yet it was laterally and anteriorly connected to the pleura, by many red and strong fasciculated fibres, which, however, were of a membranous nature. But it no where adher'd more closely to the pleura, than at the upper part ; and the pleura was there thicker, and easily to be pull'd away from the ribs : which was also easy to be done, even where it was under the inferior lobe, in which part it was pretty thick and red. The external surface of the pericardium, but only on its left side, was red, from the small vessels being turgid with blood. Within was a little yellow water. In the right auricle was a thick polypous concretion ; in the pulmonary artery, and its branches, was another round one ; a round one also in the aorta : nor were they entirely wanting in the left auricle and ventricle. The substance of all these concretions, when consider'd longitudinally, was partly sinuous and yellow, partly fibrous and brown. Above the valves of the great artery, under the very internal coat, were bony lamellæ ; and I even observ'd, that not only in the trunk of the aspera arteria, but in the beginnings of the bronchia, the annular cartilages anteriorly, that is, in the middle of each, were ossified : so that they had but little flexibility ; and if you broke them asunder, they shew'd something in that middle part, which might be suppos'd to be the beginning of marrow.

At length proceeding to the dissection of the brain, in the left lateral sinus, in the fourth, and in like manner in the third, and in some of the veins communicating therewith, I saw a white, firm, and slender polypous concretion. But the remaining vessels, which ran through the pia mater, even where it invests the cerebellum, were so distended with blood, that the small trunks of them were turgid, and the smallest branches distinctly conspicuous. These things, however, appear'd only on the left side of the brain. Yet neither the vessels passing through the medullary substance of the brain, nor those which creep upon the parietes of the lateral ventricles, appear'd to be distended with blood : and though there were hydatids in the plexus choroides, and serum in the ventricles, yet the plexusses were not discolour'd. However, there was a great quantity of water, externally, in the convolutions of the brain, which shining through the pia mater, bore the resemblance of a jelly : but there was, in fact, no such thing ; it was only a fluid serum.

12. Do not expect, that I shall give you as long an explanation as I have given you a history ; for many of the circumstances belong to other places, and shall not be neglected in other letters on proper occasions : yet it was necessary not to omit them here, lest the history should be lame and imperfect. You see, that to a peripneumony, and even a pleuropneumony, a delirium was join'd ; which has also happen'd to others (*r*), whose cases I refer

(*r*) Vid. & Jacotii Comment, in Coac. sect. 2. l. 1. aph. 21.

to other letters. But I chose to produce this at present, because the delirium was more vehement, and because you will immediately pronounce, that a phrenitis “from inflammation of the lungs”, as Hippocrates has taught us, “is bad.” And I am very well assur’d, that in some inflammations of the lungs, which were in a manner epidemic here, especially in the winter of the year 1754, whenever a delirium came on, and it did come on in many, the patient never escap’d. For which reason, it was of more consequence to commit to writing the cure of a woman, who labour’d under a complication of both these diseases (*t*), not because others are not sometimes sav’d, but because, though each of them was violent, and attended with the worst symptoms, yet they were critically solv’d, from great discharges of offensive matter, for four days together, by stool, which were of a colour partly red, and partly black. But to return to the potter: as the lungs, pleura, and pericardium, were inflam’d on the left side, so the dura mater was inflam’d on the same side also; an instance that has not been, as far as I know, observ’d by any one. And yet, perhaps, it may be explain’d in the same manner as that greater redness in the cheek, which answers to the diseas’d lungs on that side; and other things of this kind, which happen *κατὰ τὴν*, as the interpreters of Hippocrates say, and amongst these Duretus (*u*), where he explains the passage that refers to the subject, “If in peripneumonic patients the whole tongue is white and rough, both sides of the lungs are inflam’d; but if half the tongue only has this appearance, then “the lobe of that side only is affected.” But this method of explication, although it is difficult and abstruse, or certainly, if you fly to the influence of the nerves, ambiguous, as is easy to imagine, both from the writings of those of former ages, and those of the present, who have endeavour’d to explain it, yet it sometimes may have a little less difficulty, as in the present case; where, we may suppose, that the upper part of the left lobe of the lungs, not only by its old hardness, but by a newly-added turgency, from the frothy serum, and from the pleura, which was in that place become thicker than usual, might in some measure urge the left subclavian vein with compression, and consequently delay the return of the blood from the left side of the head, which, besides, is thought to be more infirm than the right. Be this as it will, (for what things may be objected I do not know, but if you grant me never so little on a subject of this kind, I shall be satisfied) at least you see what I propos’d, concerning the distension of the vessels of the dura mater, join’d with extravasated serum, was true also in this phrenitic patient. Now I will shew you, that the same distension was found in a greater degree, in a paraphrenitic patient, and attended with water.

13. A tall and lean man, who was subject to inflammation of the chest, from the trade of hemp-dressing, which he follow’d, and with which he said he had before been fix or seven times troubl’d, with a vomiting of bilious and green matter in one, and a delirium in another, was of late so affected in the organs of his voice, by the dust of the hemp, which he had taken in at his work, that he seem’d rather to screech than to speak. For that

(i) Sect. 7. aph. 12.

(i) Act. Nat. Cur. tom. 8. obs. 63.

(u) In Coac. l. 2. c. 16. n. 31.

reason, he chose out hemp which was less dusty, and comb'd it separately from his companions, and by that means had just recover'd his natural voice, when being tir'd with carrying a burthen, he was seiz'd with a febrile coldness, and a pricking pain at his left breast. For which reason he was brought into the same hospital as the two former, and about the middle of February in the same year. Although he had taken fresh-drawn oil of almonds at home, and had lost blood from his left arm, he was again bled in the other arm: for he breath'd with difficulty, and expectorated nothing. He often lay on his affected side: he threw up bilious and green matter from his stomach. On the fifth day, a phrenitis came on, being sometimes joyful, and sometimes serious, and sometimes fierce, or at least so far, that he us'd to spit in the faces of those who went near him. The physician order'd blood to be taken away from his leg, near the ancle, and a certain cataplasim to be put upon his head after shaving; which I shall more conveniently tell you the nature of, when I treat of maniacs (*). In the mean while, convulsive motions began to be observ'd, at first slight, as in the subultus of the tendons of the wrist, and then more considerable. Last of all, his respiration was not difficult; and if you ask'd him whether he felt any pain, or uneasiness, in any part, he answer'd in the negative: yet he sometimes cried out, and his urine flow'd from him into the bed, without his knowledge. At length, his pulse growing weaker, but not irregular, he died a little after the end of the seventh day.

In his body, after death, the right side of the neck was livid; as in like manner was the edge of the liver, when the belly was open'd, for a considerable tract, but to very little depth. The gall-bladder was contracted, and contain'd but little bile, which resembled the dilute colour of tobacco. The stomach was found: the pancreas thickish and hard. In the thorax no serum was extravasated. The right lobe of the lungs was every where closely tied, by interposing membranes, both to the ribs and to the diaphragm; the left, on the contrary, only in a few places, and that anteriorly. But then the right, on the other hand, was in a natural state; and the far greater part of the left was diseas'd. For first, the superior lobule, though in other respects pretty found, was lank and contracted; and in its upper part contain'd a white purulent matter, within a kind of tubercle. And these appearances, like the great number of close adhesions in the right lobe, seem'd to be the effects of the foregoing inflammations. But the inferior lobule, being red, hard, and heavy, and its substance condensated, and in its upper part pus, or a matter like pus, flowing out from the sections of the bronchia, shew'd a present inflammation, which was beginning to suppurate. The pleura, also, on the same left side, was almost wholly inflam'd; for its small vessels were too conspicuous, and the whole of it was easily drawn away from the ribs at one pull. And the diaphragm, in that part only of its centrum tendineum, as it is call'd, which lies under the left lobe of the lungs, had even its smallest vessels so distended, that you would not doubt but it was there inflam'd. In the pericardium was a little reddish and turbid serum. Polypous concretions were drawn through all the orifices of the heart: they began in the ventricles,

(*) Epist. 8. n. 8.

were produc'd into the vessels, and were all made up of a solid substance, except the beginning of that which went through the pulmonary artery, that was very thick indeed in the right ventricle, but compos'd of a kind of mucous and yellowish substance.

While the head was cut off, long portions of concremented blood were drawn out from the jugular veins, like swords from their sheaths. The vessels of the meninges were extremely distended with blood. And a polyposus concretion, white and compact in its structure, did not only possess the sinus of the falx, but even went into most of the veins that communicated therewith. In the three other sinusses of the dura mater was also coagulated blood. But the pia mater had all its vessels, even the smallest, so turgid with blood, that it was universally very red. And serum was beneath it, in the windings of the brain. In the lateral ventricles also was serum, of a reddish colour, but in small quantity. On the posterior part of the plexus choroides, were many large hydatids. However, not only the vessels which pass through the surface of the lateral ventricles were distended with blood, and for that reason, much more manifest than they generally are; but if you slightly scrap'd the corpora striata, and the thalami nervorum opticorum, or if you cut deeply into that, or any other part of the medullary substance of the brain, vessels occur'd every where, after the same manner, proportionably full and manifest. But in the cortical substance of the cerebrum and cerebellum we could scarcely distinguish any.

14. How noxious the dust is, that must be necessarily drawn into the aspera arteria and lungs, during the dressing of hemp, our Ramazini has shewn (y), when he frequently ascribes the continual cough, and asthmatic affection, of these workmen thereto. But that occasion is given to acute diseases of the lungs from thence, when co-operating with the state of the blood, which leave behind them other chronic disorders, or at length themselves destroy life, is manifest from the history I have given you. For after the man had escap'd the first inflammation of the lungs, his work did not suffer that viscus to grow perfectly healthy; therefore he was taken with others, and others afterwards, till some one not having had a perfect crisis, left, as it were, the beginning of a consumption, as the leanness and alteration of voice, but especially that collection of pus, within a kind of tubercle, shew'd. And to this was added, the last pleuro-peripneumony, which was succeeded by a phrenitis; and even a paraphrenitis, and all these join'd together carried off the patient. But I do not use the word paraphrenitis in such a sense as to suppose it a disorder arising from the most grievous inflammation of the diaphragm, and attended with those violent symptoms, with which Boerhaave (z) describes it: and for this reason I do not engage in these controversies, which are very learnedly agitated in the *Commercium Literarium* (a). It is sufficient for me, that by this word you now understand a disorder, which may, in some measure, be referr'd to the paraphrenitis. For if, by the name of paraphrenitis (b), you understand a delirium, which happens without the head

(y) Dietrib. de Morb. Artific. c. 26.

(z) Aphor. de cognosc. morb. § 909.

(a) A. 1736. Hebd. 22. n. 2. Hebd. 41. n. 1. Hebd. 52. n. 2. & A. 1737. Hebd. 16. n. 1.

(b) Vid. Sennert. Med. Pract. l. 1. p. 2. c. 6.

being primarily affected; then, certainly, an inflammation of the pleura and lungs had preceded here. Or if you understand it to be a delirium, from the inflammation of the septum transversum; we also found the septum to be inflam'd. But I would not have you believe, that I necessarily conjoin a delirium with disorder and inflammation of the diaphragm. For I know the observation of Fernelius (*c*), which militates against it, and is older than those produc'd in the Sepulchretum (*d*), from Willis. But as neither of them expressly mentions the inflammation of that part of the septum particularly, which is most of all attended to by those who account for a delirium from inflammation of the diaphragm, I mean of the centrum tendineum, but each of them produces disorders of the fleshy part, I will just take notice, that I have seen its tendinous part also inflam'd, when the mind had been scarcely confus'd, or in the least delirious, in the last period of the disease; as, when I treat of the peripneumony, I shall (*e*) shew. There are, however, two observations in the Sepulchretum (*f*), one of Blasius, and the other of Lælius a Fonte, the latter of whom saw the diaphragm suppurated after a delirium, and the former greatly inflam'd after a phrenitis. And as I saw that both of these observations made mention of convulsive motions also, which had in like manner been observ'd by me; and as I remember Galen (*g*) has written, that "they who have the septum transversum inflam'd, are liable to convulsions;" and as I also observ'd, that Blasius had not only seen an inflammation of the lower part of the liver, but also a polypous concretion in the same sinus of the dura mater, as I did, and extended into the same veins; I did not think it would be altogether useless, if I should read over those observations in the books of each author. But the trouble of seeking was greater than the utility, by reason of the ambiguous mark with which the sixth part of Blasius is pointed out, and the deceitful number of the consultation of Lælius, which points out 132, instead of 130; although I found there was some amendment necessary in describing the observation of one, and something to be added to the description of the other. Yet this I was assur'd of, that Blasius, who open'd the head, for Lælius never touch'd it, really had not mention'd the inflammation of the pia mater. So that you have a more distinct example of the parephrenitis in his observation, than in mine; because, if not primarily, at least afterwards, this membrane was so much inflam'd, that I never remember to have seen it more. But however these things may be, let me shew you also a delirium attended with an inflammation of the dura mater, or at least, with a disorder approaching thereto.

15. A woman, who had been long before in the hospital at Padua, for a blow on her head, and being cur'd, had gone out, fell afterwards into a fever, was delirious, and died. The head only being brought into the anatomical theatre, about the end of the public demonstrations which I made in the year 1736, I carefully dissected the brain, in its situation. There was no where any particular mark of that blow. The dura mater being taken

(*c*) Pathol. l. 5. c. 11.

(*d*) Sect. hac 7. obs. 1.

(*e*) Epist. 21. n. 35.

(*f*) Sect. cit. obs. 15 & 37. quæ suspens. l. 2.

S. 4. obs. 19.

(*g*) De Puls. ad Tyr. c. 11.

away, its internal surface appear'd to be distinguish'd with frequent scarlet spots, like drops of blood. The vessels of the pia mater were turgid with blood; and under that, in some places, was serum, which there was not in the ventricles. In the posterior part of the plexus choroides were vesicles. And before the pineal gland was a little yellowish matter. Every thing else was natural and found; unless that the cerebellum was very lax. I found no polypous concretion in any of the vessels.

16. In violent deliria, it is not only certain, that the vessels of the dura mater are found "very turgid," as Slevogtius (*b*) says, but that the very substance thereof is also frequently inflam'd: to which you may refer those scarlet spots of that membrane. But in this woman, besides a fulness of the vessels, water was not wanting under the dura mater. Nor was it wanting there in the man, of whom Valentinus (*i*) speaks, as having labour'd under a fever, and violent deliria: for at the same time that the veins were very turgid, in the whole brain, "immediately under the pia mater much pituita, "and yellowish water, condensated into the form of a jelly," were found. And I have also given an account above, of the ventricles being full of serum, from Moglingius (*k*); to omit other examples of water in the brain of delirious persons. But these things now bring to my mind a conjecture of mine; of which, that you may the more easily judge, I must go pretty far back to relate it. In the beginning of the month of February, in the year 1711, fevers of the worst kind began to spread very much in the place of my nativity. The pulse in all of them, even the most robust young men, was very small, weak, obscure, and confus'd. In most of them was a strong subfultus tendinum at the wrist, and a soporific affection. And in some finally, was a singultus, and extreme dejection of the strength and spirits, with a lividness of the face, and the fingers, and other symptoms of the same kind. I was the first who observ'd these fevers; and even after all these bad symptoms, which I have mention'd, with the divine assistance, I very happily sav'd patients that were already consider'd as the dead that were to be mourn'd for; two of whom were, some years ago, still living, as Cornelio Denti, a nobleman, who recover'd by means of a long and large critical discharge of urine; and Ignatio Garavini, an ingenious mechanic, who recover'd by means of a critical diarrhea. About the end of February, the convulsive subfultus, singultus, and lividness, were not observ'd in those fevers; but deliria began to come on, yet were not violent, and only when the fever was exacerbated. Yet those who were thus affected, still escap'd, and among these, that noble priest Tullio Castellini; who, I remember, although he had receiv'd no benefit from these evacuations, by which the others were reliev'd, especially by a long moisture of the skin, yet found himself begin to be much better, after having discharg'd by his mouth a red round worm, longer than a span, and thicker than a quill with which we write. But at length, in the month of March, although the fevers were attended with symptoms, much milder in appearance, and the pulse and tongue seem'd to promise a happy event, contrary to what they did in the former; yet the cure went on less prosperously than in the former, deliria com-

(*b*) Dissert. de Dura Matre § 29.(*i*) Eph. N. C. Cent. 10. obs. 94.(*k*) n. 8.

ing on differently from what they had in them, and attacking the patients after a violent pain of the head. But to imitate the Hippocratic simplicity in both respects, being call'd in at the middle of the disease, by senior physicians, we could by no means save two patients, Vincent Mangazzini, a very respectable young man, and Jerom Gnocchio, a nobleman and a priest. But we perceiv'd beforehand, that a vehement phrenitis threaten'd the former, from the signs which were taught us by our ancestors, among which we particularly remark'd this, that the patient seem'd to himself to hear continually the music of the organ, which is us'd in churches and consecrated buildings; like the person, who said to the collectors of the Bibliotheca Anatomica (1), on the last days of a fatal fever, "that he perpetually heard a kind of very " sweet concert, or melody, to which a delirium at length succeeded." In Gnocchio, this seem'd worthy of remark, that the delirium always came on immediately when his whole body was in a sweat, and at that time only. And though we may also account for this very peculiar circumstance, by supposing, that much serum being taken away from the blood by the discharge of sweating, the parts of this that remain'd, as they were less dilute, so they were more acrid, and more apt to irritate: yet, perhaps, nothing forbids to deduce it from that, whence I seem to have digress'd; I mean, from too acrid a water, which in the former patients, as the very cold season at that time dispos'd them, was so copiously discharg'd by the kidneys, but in this patient, secreted from the blood under the pia mater, at the same time with the sweat, and from the same cause. But as I was not permitted to enquire, by dissection, which conjecture of the two might seem to be the most just, I will rather go on to shew, that there has been a slight delirium, where I found scarcely any traces of water, whether this happen'd by chance or otherwise; and at the same time, produce an example of the slighter species of delirium, that is, of a paraphora, as physicians sometimes understand this word, after I have given you instances of the phrenitis, paraphrenitis, and more violent deliria.

17. An old woman, being seiz'd with a slight fever, which the physician hop'd to have been able to overcome with the Peruvian bark, it not only did not yield thereto, but degenerating into an acute fever, with slight wanderings of mind, she died.

Some of the viscera of the belly and thorax, together with the head, being brought into the theatre, I dissected them, not many days before I dissected the brain of the former woman. Some things that were unusual, indeed, but not altogether unnatural, offer'd themselves to our inspection, in the right kidney, and in the heart itself; which, as they did not seem unworthy to be demonstrat'd to every one who was present at that time, so I think are not unworthy of being related to you at present. For from that kidney two ureters proceeded, the upper from a more simple pelvis, and small; but the inferior, somewhat thicker, inasmuch as it proceeded from a pelvis, which was render'd larger and more prominent, by the confluence of many tubuli into it. As the origin of each ureter was distinct, so was its progress and insertion; for betwixt the orifices of the two tubes, was an interval of a finger's breadth. Both were oblong, and open'd by an oblique line, as they ought,

(1) Tom. 2. in Adnot. ad du Verney Traët. de Audit. Org. p. 3.

into the bladder; so that one was quite superior to the other. But in the heart, instead of the valve of the coronary vein, I found a kind of net-work, not differently form'd from one of those varieties of the valves, which you will see describ'd by me in the last place but one, in the *Epistolæ Anatomicæ* (m). But these appearances, as I have said, are not altogether so preternatural as what I saw in the great artery, but especially as what I saw in the uterus. For in the aorta I saw, internally, white beginnings of ossifications, a little above the semilunar valves, and at the vertebræ of the loins. But when the uterus was open'd, I found in the posterior, and at the same time, superior part of its fundus, an *excrecence*, of the circumference of a circle, of a colour externally bloody, and stretch'd out from the right side towards the left; almost a third part of its border, which lay inferior and more to the left, being disjoint'd from the uterus, so that it might be lifted up with a probe being put under it. The remaining part of it was very intimately connected with the substance of the uterus, and indeed seem'd to be made up of the same substance, unless that the whole excrecence, by cutting into it, was found to be more white, hard, and compact, than the uterus itself. Without doubt, this was a schirrus, or if you would rather have it so, the beginning of a cancer, at that time occult, very low, plane, and smooth, nor bigger than so as to be cover'd by the point of my thumb, when extended. If you consider'd the structure and superficies of the neighbouring cervix uteri, and the membranous ring of the hymen, which was of little depth in its surface indeed, but no where lacerated, you would readily conclude, that this woman had had but very little commerce, if any at all, with man.

The cranium at length being cut open, and the brain accurately examin'd, nothing offer'd itself any where to me which was worthy of notice, except the vessels of the pia mater distended with blood, and this membrane itself, which was easily drawn off by the fingers from the brain where-ever you pleas'd: so that, although I scarcely saw any water, yet I conjectur'd, even from this mark, that it was not altogether wanting.

18. If you should expect, that before I make an end of writing, I begin to point out in what part of the brain, and in what manner, the motions are made, or what kind of motions they are, when deliria are excited: you would seem not yet to be sufficiently acquainted with me. For all I could do would be only to give you some general hypotheses, which for that reason are known to you and to others; and even those I should give you very timorously and cautiously. The other considerations, I think, must be refer'd to that time, in which physicians thought it praise-worthy to enquire, in such a manner, not only into all abstruse things, but even those which are plac'd beyond our capacity, that when they could not find out the real causes of them, they made no scruple to invent others. And I could wish that so much place was not given to these random conjectures in the scholia of the *Sepulchretum*; for they frequently take up more room there, than the histories of the disorders of the head, or even many put together. And it is still more to be wish'd, that the same things were not sometimes repeated over again in one and the same scholium (n); especially such things that you may learn to be entirely contrary to all probability, from almost every dissection which I shall give the relation of in the next letter. Farewell.

(m) *Epist.* 15. n. 20.(n) *Ad obs.* 1. sect. 6. l. 1.

LETTER the EIGHTH.

Wherein Madness, Melancholy, and Hydrophobia, are treated of.

TWO sections follow in the Sepulchretum, one of which is entitled, *De mania, & rabie, seu hydrophobia*; the other, *De melancholia, & affectione hypochondriaca*. But it is not my intention to treat separately of this last disorder, because I consider that it does not prove mortal, except when it is attended with others more violent; as even the examples, which are produc'd in the Sepulchretum, sufficiently prove: for this reason, then, whatever relates to this disorder, will be treated of, together with those. Madness, to use the words of Willis, which are produc'd in the same volume (*a*), "is so far a-kin to melancholy, that these disorders often mutually inter-change their appearances, and go over one into the other." And you often see physicians doubting, on the one hand, from taciturnity and fear, and on the other, from loquacity and boldness, every now and then alternately appearing in the same patient, whether they should pronounce him to be afflicted with madness, or with melancholy. And this consideration made me endure, with more patience, the answers which I have frequently receiv'd, when, upon dissecting the heads of persons who had been disorder'd in their senses, I have enquir'd with which of the two deliria they had been affected; answers, which were frequently ambiguous, and often repugnant to each other, and yet perhaps true in the long course of the disease. Wherefore, although in the dissections I am going to describe to you, I shall signify when I know that the patient inclin'd most to the one, or to the other state of the disorder; yet, as I shall be able to do that but seldom, I chose rather to comprehend in this one letter what relates to either of these deliria, and in the conclusion to add those histories which belong to the hydrophobia; especially as I have but one history from Valsalva relative to these species of deliria, and with this, as usual, I begin.

2. A virgin, of more than twenty years of age, being extremely desirous to withdraw into a nunnery, and being refus'd what she desir'd, her mind began to be a little weak and unsteady, from the moment she heard the news of her repulse: and very soon after, she began to reason incongruously, which increas'd on her more and more every day; so that she frequently refus'd to take food. Some months were thus pass'd, in which time, beside a fever that attack'd her many times by irregular returns, a more violent madness came on, without a fever; so that she endeavour'd to strike those who sat by her: and her strength decreasing by degrees, she died.

The skull being open'd, some little white bodies were seen at the sides of the longitudinal sinus, in the dura mater externally; some of which were

(a) In schol. ad obs. 1. sect. 8. ejusd. l.

round, others oblong, and some of a figure perfectly irregular, but all soft in their consistence: Valsalva thought that they had their origin from a concreted humour, for this reason; because he had seen similar bodies, from concretions of pus, stagnating about the same membrane, in patients who had died from wounds of the head. But in that sinus was a slender polypous concretion, which extended itself through the whole length of the cavity. The brain was moist; and in its larger ventricles was a little quantity of serum. However, in the plexus choroides pretty large glandular bodies were prominent, which had been indurated into a solid body, yellow, and somewhat globular in its form.

3. If besides this virgin, whose delirium had degenerated from melancholy into madness, Valsalva had had as frequent opportunities of dissecting other bodies of insane persons, as he had of attending to their disorders while living; I doubt not but he would certainly have observ'd, what I have observ'd in all I have hitherto examin'd, that is, a considerable hardness in the brain. But as to what relates to those tumid bodies in the plexus choroides, and to the little bodies which he describ'd at the sides of the longitudinal sinus; I believe, I have already mention'd to you a larger extuberance in that plexus than either of these (*b*), and yet not in the head of a maniac, or melancholic person. And I suspect that those corpuscles, which rais'd themselves up here and there from the dura mater, were probably of the same kind with these, which were afterwards call'd glands by Pacchioni, which are seated in those very places, being sometimes less, yet often still much more, conspicuous. But although these are neither preternatural, as the cavities, or pits, impress'd on the inside of the skull, to receive these little masses, evidently shew, nor were unknown to anatomists two ages ago, after Vesalius (*c*), who calls them *tubercula*; and though they were even again set forth as new appearances, a little before Valsalva was born; yet at the same time in which he wrote that observation, they had been, in some measure, forgotten again. But I shall demonstrate all these things, more at large, in another place; nor will I conceal the experiments which I have made, in order to ascertain the nature of those corpuscles. At present, it will be more proper, I think, to confirm by the production of six or seven dissections, that very singular hardness, which, I say, I have always observ'd in the cerebrum of maniac or melancholic persons.

4. A tall robust youth was seiz'd with madness, in the year 1729. The physicians order'd blood to be taken from his temporal artery, to the quantity of a pound, which was about the end of June. Scarcely an hour pass'd from the time in which the surgeon had perform'd the operation, when the young man was found dead, with his tongue hanging out of his mouth. That you may not accuse a kind of remedy, which has been us'd by ancient and modern practitioners in medicine; and approv'd of by the happy successes of M. Aurelius Severinus (*d*), (instead of whom I see that Hildanus is heedlessly commended by many) and others (*e*); and sometimes even found

(*b*) Epist. 4. n. 32.

(*d*) De efficac. Medic. 1. 1. p. 2. ubi de Arteriot.

(*c*) De hum. corp. fabr. 1. 7. c. 2 & Explic.

(*e*) Eph. N. C. Cent. 3. obs. 60.

Fig. 1. ejusd. libr. 7. ad K.

to administer an immediate cure, as in the case of the robust virgin; and that you may not blame the undeserving physicians, as the vulgar are wont to do, or throw the fault upon the surgeon; and also, that you may the better form a judgment of some things which were remark'd in the body after death, I must not conceal from you, what the person who had committed the fact could not sufficiently conceal. The fact was this: the patient, in consequence of his madness, had remov'd the bandages, which had been just applied to the wounded artery, so that they were immediately under a necessity of being replac'd, after the loss of a very little blood. At this refractory madness, however, the person to whose custody the patient had been committed, was so enrag'd, that after having miserably beaten him with his fists about his belly and eyes, being grown more mad than the madman himself, he threw a very streight bandage about his neck, and departed.

Examining the body the day after, I did not wonder, for the reasons I have mention'd, that the face was of a black, purple, and livid colour; that on the feat of the nasal bones, which by feeling with my fingers, I knew to be broken, the flesh was almost entirely black; or that the belly was turgid, and in many places of a green and livid complexion. And having examin'd the thorax, so far as to observe the lungs to be moderately tumid, a foam in the aspera arteria, though not in considerable quantity, and a large quantity of fluid blood in the pulmonary vein; and that the valves of the pulmonary artery were harder than naturally they are; every thing else seeming to be very natural, I immediately pass'd over them, in order to enquire more accurately into the state of the brain. The vessels of both the meninges were distended with a black and fluid blood, as those were, in like manner, which crept through the sides of the septum lucidum, and the remaining parietes of the right and left ventricle. And these ventricles also contain'd a great quantity of turbid water. Yet the plexus choroides were red: and many vesicles lay on their posterior part, which were fill'd with water, and among these was one equal in bigness to the size of a moderate grape; through the coat of which, vessels pass'd, equally as big as those in the neighbouring membrane of the plexus, and in the same manner. But nothing occur'd which was more worthy of observation than the hardness of the cerebrum. For whether you cut into its medullary or cortical substance, you perceiv'd the substance to be very hard, at the same time that the substance of the cerebellum, or at least the cortical part of it, was even rather softer than it generally is.

5. In order to keep the more audacious madmen within bounds, Celsus has admonish'd (*f*), "that stripes also should be applied, and that they " who behav'd themselves with more violence should be bound, that they " may not hurt themselves or any others." Yet all this ought to be within bounds, like a parent who corrects his children, and not like an executioner, who uses all kinds of violence against his prisoners. I remember that Valsalva, when he had under cure maniac or phrenitic patients, whose arms it was necessary to confine with bands, was accusom'd to inculcate carefully, into his domestics and keepers, that they must be cautious lest the patient

should get any injury from thence: that the bands, indeed, should be strong, but neither tight nor hard; and for this reason he would have soft linen or woollen cloth sew'd within the leather straps (g).

As I have once or twice spoken of maniac patients, cur'd by Valsalva, you will perhaps ask me, whether he had any thing peculiar in his treatment of them? He made use of the same kind of remedies as most others do; but, as it becomes a good physician, he made use of different kinds on different occasions, but on all occasions he made use of as few and as agreeable as he could: so I remember, that some were restor'd by him, even by emulsions made only from the seeds of melons, to which he had neither added the seeds of poppies, nor what he knew by experience to be more efficacious than them against watchings, the syrup of poppies; so far do little matters sometimes perform what violent methods can by no means achieve. A physician, of undoubted veracity, has more than once affirm'd to me, that when, in case of insuperable phrenzy, he had order'd five or six grains of opium to be dissolv'd in those waters, with which raggs were to be moisten'd, and applied to the forehead; and these waters had, by the mistake of those who attended the patient, been given to him for drink, he saw no effect from thence. And concerning this subject, there was a very singular opinion of Francesco Spoleti, formerly primary professor of medicine in this college; who returning from Constantinople, where he had practis'd physic, with success, even in the seraglio of the Grand Signor, for some time, and confirming to us what we read of opium being much more pure and efficacious there, than among us, inasmuch as it verges to the colour of cinnamon, and has a very narcotic odour, as we say amongst us, and is there taken by many accusom'd to that practice, not to make them sleep, but that they may watch chearfully; and that in the dose of a drachm, or at least, as a chemical friend of mine, who had been with him, had seen, to the quantity of a scruple; added his suspicion, that the cause of the different effect thereof upon them, and upon us, consisted in this, that a much greater weight of some medicines must have quite contrary effects to a very small one: just, said he, as if a thread, lying round a fibre, be moderately tied, you will then compress the fibre; but if you draw the string with a much greater force, you break asunder, not compress, the fibre: as if it were possible to cut the fibre asunder, without first greatly compressing it! But he rather meant this, which I will shew by an inverted example: if a very slight wind agitate a flame, the flame is thence encreas'd; if a violent one, it is extinguish'd: although by this it is not understood, why those who are accusom'd to it there, can do that; and they who are unaccusom'd, as here, cannot do it; that is, watch chearfully and briskly, after taking a scruple of opium. For I do not enquire, why they do not sleep there, or why they do not watch in a heavy and besotted state, like those who are drunk; but why most of them watch with alacrity and liveliness? As I am not ignorant, that there are among us, and in other places, some to whom, as they accusom themselves to it by degrees, a scruple of opium, or more than that, was not only not noxious, but even useful against pains; and that there are, among the Turks, some who devour much more opium than Spo-

(g) Vid. Epist. 16. n. 4.

leti said, yet are thence made stupid and sottish, and that in the highest degree. But these things draw us a great way from our histories, to which, therefore, it is proper that we return.

6. A butcher, who had been disorder'd in his senses for fourteen months, from the effects, as was said, of a love-potion, at length died, in the beginning of the year 1719, by the violence, as was suppos'd, of the very cold season, from which he took no care to secure himself. Looking through the belly and thorax, I observ'd nothing worthy of remark, except the heart, every where connected with the pericardium; and under the abdomen, slight ulcers of the præputium, cicatrices of the urethra, and very few of those canals which I have particularly describ'd in the *Adversaria*. As to what relates to the head, although I found water extravasated under the pia mater, yet the cerebrum was of such a firmness, that I then never remember'd to have dissected one more hard. Moreover, in the superior and posterior surface of the corpus callosum, I did not find those two prominences which Lancisi (*b*) calls *nervuli longitudinales*; but instead of them, two pretty deep furrows. And having cut into the fornix, which was itself hard, not far from that part of it which is call'd its basis, and having turn'd it back, together with the plexus choroides, I saw a kind of pellucid lymphæduct, creeping separately through each of the knots of that basis, which were continu'd on each side through the medullary tracts, with which the upper borders of the third ventricle are adorn'd (Lancisi (*i*) call'd them frequently "processes, or little nerves, coming out from the basis of the pineal gland"); and as they crept through those tracts, they seem'd a little more evidently to contain lymph, and to be distinguish'd with little knots; and finally, they seem'd to bend their course towards that gland; to which was annex'd, at its anterior part, a little congeries of yellow matter, form'd into minute granules. But it was matter of great chagrin both to me and to the celebrated Vulpius, who was present, that this species of pellucid vessels, which appear'd to us in the manner I have describ'd to you, were entirely vanish'd before we could certainly determine what they were; although we tried every method to find it out, that our unprepar'd stare would admit of. Yet this vexation was in some measure alleviated by the unusual firmness of the cerebrum; allur'd by which, I fought after more easily, and more clearly discover'd, many things in the substance of that, and of the medulla oblongata; so that I think, the brain of insane persons of this kind is the most fit of all to trace internally the origins of the nerves upon, and the course of their tracts, and other things of the same kind; the investigation of which is much more difficult and obscure in a more soft brain, as it generally happens to be: so that the same things be but sufficiently confirm'd afterwards, in the brain of some healthy men, which is less soft than they commonly are when dissected.

7. That madness may be brought on, by a philtre, or love-potion, is certain (*k*). But whether this man was mad, is uncertain; especially if he perish'd by the violence of the cold, of which disorder'd persons of that kind

(*b*) Dissert. Var. VII. fig. 1. litt. dd.

(*k*) Vid. P. Borell. Hist. cent. 1. obs. 65.

(*i*) Ibid. fig. 4. litt. gg.

are generally us'd to be extremely patient, and with impunity. And from this mark I am induc'd to suspect, that the two women, whose histories I shall presently subjoin, did not labour under a madness, at that time at least, when the one in the depth of winter contracted an angina, and the other an inflammation of the thorax. But because this is generally true, yet not always, nor in all cases (*l*), I will leave the matter undetermin'd. But whatever kind of delirium this was, that appearance which was seen by me in the corpus callosum of this insane man, might seem to confirm the opinion of Lancisi, concerning the seat of the *anima cogitans*, or soul (*m*), if we had seen any thing of that kind in others also (*n*). But you will know, when we come to the last (*o*) of these dissections, what is seldom, what often, and what always, found. In the mean while, those things that I hinted to you, of some common internal remedies for madness and phrenitis, in the former letter (*p*), bring back to my mind that I promis'd to declare, what was the composition of a certain external remedy against both these disorders. But don't suppose that I shall here take notice of what a certain physician, who was a friend of Valsalva's, asserted in my hearing, that he could not cure a maniacal person, who was known to both of them, before he had taken care to have his head shaved, as often as the hair grew to the height of a finger's breadth; and when this was first done, that much more ill-smelling fordes were found, adhering to the skin, than any one would have imagin'd. Nor expect me here to produce any foreign remedy externally applied to procure sleep occasionally; although my friend Ramazzini testified to me, that even opium itself dissolv'd in wine, with which he had order'd the temples to be bath'd, in obstinate watchings, or dossils of lint dipp'd therein, and applied to the internal nostrils, had but just brought on a slight sleep. It was a remedy easily prepar'd, and worthy of the verse of Samonicus, which a physician was accusom'd to use against phrenzy and madness, whom, if nothing else, at least a long age and experience seem'd to recommend. He then, us'd fresh cheese, of the coarser sort, mix'd with oil of violets, and laid it upon the crown of the head, after being fresh shav'd, and order'd the application thereof to be renew'd three times every day. You will ask, whether this was done with success? And I will answer you, by telling you what I saw. A strong man, by trade a blacksmith, having been liable, from a boy, to the incubus and vertigo, which had been brought on him by a fright, fell down suddenly in the winter-time, and complain'd, in confus'd words, of an internal pain in his breast. Being immediately brought into the hospital, he answer'd scarcely any thing to those who ask'd him questions; but shut his eyes, and cover'd his face with the sheet, like a man out of his senses. He was hot at the same time, and trembl'd; nor had drunkenness, or any other cause of that kind preceded: and a fever likewise attended. On the following day, he began to leap out of bed, to cry out, to threaten, and even to strike, all about him; so that being evidently a maniac, it was necessary that he should be confin'd with bands. He cried out violently and

(*l*) Vid. Etmuller. Prax. l. 2. f. 3. c. 4. art. 2.

(*n*) Vid. Epist. 61. n. 6.

20. 3.

(*o*) N. 13.

(*m*) Dissert. VII. paulo ante cit.

(*p*) N. 13.

continually; and, at the same time, his whole body was agitated with convulsive motions. Then the physician, having order'd a vein in the foot to be open'd, and a pound of blood to be taken away, also order'd the cataplasim I have told you of, to be laid upon his head, after being shav'd. Do you ask me what was the event? Why, by this means, within twelve hours, he was restor'd to perfect sanity; but whether the cure was accidental, or the effect of blood-letting only, or in some measure owing to the assistance of the external remedy, I will leave you to determine. Those who foment the heads of insane patients with milk, will readily believe, that the cataplasim contributed thereto. But you, whether you think that nothing is to be neglected in the art of physic, or whether you wish that nothing should be left obscure, or unexplain'd, among those things that I have written to you, will perceive, that I have satisfied you in each of these particulars. But do you give no account of your own practice? You will say, give me leave, I beseech you, first to produce the dissections of the two women, of whom I spoke a little before. Then, in obedience to your commands, I shall, perhaps, go on to talk triflingly; but whether my discourse is trifling or grave, assure yourself, that I shall produce nothing but what is true.

8. A woman, of forty years of age, who was disorder'd in her senses, was carried off by an angina. Her body was brought to me at the college, before the middle of February, in the year 1719, when I was publicly teaching anatomy. As the body was not proper for the purposes to which I wanted it, because the muscles of the abdomen were already green, though it was but a few hours after death, and the intestines, which were distended with flatus, were not entirely free from inflammation, having just examin'd the uterus, the smallness of which was a proof that she had not borne any children, the breasts confirming the same, as although they had a little milky serum in them, they were yet very small; I undertook only to dissect the brain, as I was then much streighten'd for time. And this I found to be very hard, just as I had done before in the butcher.

9. Another woman, who, it was very certain, had been brought to bed of a child the year before, nor had been any the better in her senses after it, continu'd to run about through the public streets, as before, unless prevented by any one, yet without doing any injury to those she met, as far as I could learn. She had begun to be insane almost nine years before the time I speak of, on account of the man whom she lov'd being kill'd the day before he was to have been married to her. At length she died of an inflammation of the breast, in the beginning of December, in the year 1725.

I dissected the head only. Under the pia mater was water, not without air-bubbles here and there; which I saw also in some of the vessels, in a very crowded state, so as to fill them. But there was no water in the lateral ventricles; in which the plexusses and the vessels were red. To the basis of the pineal gland, anteriorly, adher'd a little white matter, degenerating into a yellow colour, which seem'd to be a congeries of calculi; but being examin'd by the touch, it was not found to be calculous, and even scarcely at all hard. As I cut the brain into pieces, I remark'd, that the medullary substance was not very white, but brownish: and this, perhaps, was owing to the sanguiferous vessels being fuller than usual; for the deeper I went from the cortical substance,

substance, the less brown did the medulla seem to be. This, however, is very certain, that the same medullary substance, throughout the whole cerebrum, and in the parts of it that are seen in the ventricles, was of an unusual hardness; and that the nerves themselves, within the cranium, appear'd to be more firm, and less moist, than usual, when they were cut into. But as in the cerebrum, the cortical substance was also pretty firm, so it was very soft in the cerebellum; although the pedunculi, and the internal medullary part of the cerebellum, which lay round them, were indeed pretty firm.

10. Now, if I tell you what I have found useful, in women or men of that kind, who were delirious without a fever, I shall seem only to do what is already done. For that in the beginning of the disease, especially when there was an hypochondriac melancholy, or when any particular place or object gave occasion to its origin, I have found nothing better than for the patient immediately to undertake a long journey, in the company of prudent and chearful friends: or if this could not be done, that the saccharum saturni, cautiously given, was of use to some, and to others bathing, and to many length of time, more than all remedies: I say, though I should relate these things, and others of the like kind, to you, yet I shall have said nothing which you do not often read.

It will be, perhaps, more useful to describe perspicuously and accurately, yet in as few words as can possibly be, on so long and various a subject, a peculiar succession of diseases, the last of which was a mania, and that in a short time cur'd. In the year 1711, when, by the blessing of God, I very happily cur'd Lodovico Albertini, a very worthy archdeacon in the church of Forli, in a very difficult case; he had, among the rest of his servants, a running footman, of twenty-three years of age, slender, and of an unhealthy complexion, whom, being tir'd with much labour, a fever had seiz'd in the beginning of September: the fever was continual; and though it seem'd to approach to a double tertian, yet it was very irregular, and attended with various other symptoms of disease. For sometimes pain and heat of the head, back and loins; sometimes watchings, and at other times stupidness, so that he would scarce answer any body who ask'd him a question; sometimes a sense of internal heat, and unaccountable anxiety; at others, a thirst, slight delirium, and coldness of the feet came upon him; but some at one time, and some at another, without any order at all. A smallness and weakness of the pulse was almost an universal attendant of the disease. Blood being taken from his arm twice within the first eight days, the serum was of a saffron colour, and the crassamentum, at the first bleeding, but still more at the second, had a thick crust covering it, which was somewhat of a livid colour. His urine was at first thick and red, but afterwards thin; and although the quantity of it answer'd very well to what he drank, and even sometimes exceeded that proportion, and finally, although it had frequently something swimming in it, yet it never deposited any sediment at the bottom of the glass. He had, at one time, a diarrhea, with many very liquid stools, otherwise he was, in that respect, as if he had been in health, but his stools were sometimes yellow; and he once discharg'd a couple of worms therewith. A sweat broke out twice over the whole body, but generally only on the forehead, and in that part it was sometimes cold. Once blood flow'd out of his nostrils,

nostrils, but in small quantity only. Moreover a pain, which began about the ear and the fingers, seem'd sometimes to indicate an endeavour of nature to deposit something upon those parts. Thus he went on to the fourteenth day, when convulsive motions appear'd on that, and some of the following days. Yet on these days, the patient was more lively and brisk, and had a better aspect; for a little before, his face had been swollen, and somewhat livid. As the convulsive motions went off, the skin of the shoulders and breast began to have a slight redness, and become a little rough. And to show you that this endeavour of nature was not altogether useless, though not sufficiently useful; neither watchings, nor thirst, nor any indisposition of that kind, now any longer remain'd; and even the pulse was very nearly restor'd to its natural regularity. But his stomach was not strong, and blood easily distill'd from his nose, if he wip'd it in the least with his handkerchief; and presently, after pains of the belly, he had fluid stools, of the colour of tobacco; and a few days after his fever was encreas'd, but not without a coldness preceding.

Therefore, although throughout almost the whole month of September, I endeavour'd to assist nature, as occasion seem'd to require, and took the utmost caution, lest I should impede her in any of her motions, or pull down the strength of the patient; yet he was so far from becoming well, that one disorder continually rose after another, For the day after the fever was somewhat encreas'd, as I have said, his continual complaints of thirst, the swelling of his face and his hands, and the belly raising itself up above the navel, in an equal tumour, shew'd that a dropy was at once threaten'd, and at hand. And this dropy, moreover, encreas'd so fast, that although he made no small quantity of water, which I, in some measure, promoted, and soon after very large quantities were secreted, yet the thirst not only became more violent, and the watry tumour extended itself under the skin universally, but a dry cough also came on, which was so much the more troublesome, as colourless blood frequently flow'd down from his nose, even of itself, and without any impetus being applied; the patient was at the same time oppress'd with a difficult respiration and stertor, and had his muscular strength, and that of his pulse greatly decreas'd; so that within five days, and not more, the affair seem'd thus far brought to an issue, that the faculty of speech being also lost, he was look'd upon by every body as desperate, and at the point of death. But to me, who did not omit, either before or now, whatever I could do in so dangerous a case, be it never so little, some prospect remain'd, from the quantity of water which still continu'd to be excreted. And my hopes were presently encreas'd, by observing some very minute kind of sandy particles, which were in very great number, and almost cover'd the whole sides of the urinal internally. For this sign of a happy solution of the disease, which I have observ'd in many patients, as I will tell you more largely on another occasion (*q*), I had never found fallacious to that time. And indeed the patient soon began to be a little better, and even to speak: and the tumour of his whole body and thirst to decrease; nor did blood any more flow out from his nose. Yet the stertor even then continued. But

three days had scarcely elaps'd, from the time in which he seem'd to be giving up the ghost, when scarcely any difficulty of breathing remain'd, and two days more being added, there were in no part any traces of a dropsy; so that as many days as it took up in its increase, so many did it take in its decrease. The cough now and then recurr'd, but seldom; and once only forc'd a little, but well-colour'd blood from the nose, and sometimes disturb'd his easy sleeps. This, however, it was not difficult to obviate, nor yet to take off the constriction of the belly, which was now too great; and at the same time to deterge it. At length, after a long want of appetite, a desire after food began, and the pulse, which was before no longer weak, but had continu'd frequent, began now to be less frequent: the patient had a natural stool every day, and his strength was by degrees restor'd, so that he could sit up a long while in bed, without any detriment.

Every thing now seem'd to be very safe, unless that the urine, which continu'd to flow in great quantities, even after the dropsy had subsided, though it return'd gradually to its natural bounds, never shew'd that kind of sediment in the bottom of the glass, which is usual in those cases, and which I earnestly wish'd. Wherefore some error having likewise been committed in the article of eating and drinking, as I afterwards found out, the urine not only became decreas'd in its quantity, but also appear'd red, and thick: and immediately a quantity of bilious matter was discharg'd by stool, attended with gripings and tormina of the intestines: and this began on the tenth day, after the dropsy had been perfectly resolv'd. Although I was not ignorant (*r*), "that in diseases, where one continually succeeds another, they "are generally mortal;" and although I was fearful, lest a frequent and copious discharge of the intestines, attended with much pain and torture, should so far afflict a patient, who had now suffer'd for fifty days, all the manifold and grievous symptoms I have describ'd, that I should never be able to raise him again; yet at first I resolv'd to wait a little while, and so far to pursue an intention of cure, as to see, that he was not grievously ex-cruciated with his pains.

I had not waited quite two days, when behold the patient was attack'd with a fourth disease, the third still remaining; I mean a mania, for the sake of which I determin'd to give you this history, that is longer than I intended in the beginning it should be. And first, indeed, I thought it was a phrenitis; for it seem'd once and again to grow stronger with a fever. But after I had observ'd the fury still to remain, when the fever was gone, so that it was not safe for any of the assistants to come near the patient, who was free from confinement; I no longer doubted but it was in fact a madness; and I learn'd that this kind of insanity may be excited, after a long autumnal fever; although this was not of the intermittent kind, which, as Sydenham (*s*) had admonish'd us, is succeeded by a peculiar kind of madness, and as Boerhaave (*t*), who follows him in this, has confirm'd. But that this kind of delirium sometimes is the consequence of other fevers, an observation of

(*r*) Hippoc. 1. de Affection. n. 23.

(*s*) Obs. Med. circa Morb. Acut. S. 1. c. 5.

(*t*) Aphor. de cogn. morb. § 1125.

Borelli (*a*) teaches, and in like manner another, commended by Etmuller (*x*). But this of mine exhibits a madness, which succeeded a fever indeed, but still more properly a dropsy, by which, that a madness is us'd at other times to be critically solv'd, or at least diminish'd, the aphorism of Hippocrates (*y*), though the celebrated Pafsa has some doubts upon this head (*z*), demonstrates. "A disorder of the intestines, a dropsy, or slight delirium, succeeding to a furious madness, are favourable signs." With which opinion Jacotius (*a*), comparing another of Hippocrates, "Epilepsies that happen in dropical disorders are fatal," has added the following words: "For which reason, any thing that should seem to be of advantage, not only is of no advantage, but even has a contrary effect; so that, for instance, to a dropsy some grievous disorder of the head is added; and that this is extremely bad, is very certain for many reasons."

But these words are to be consider'd as relating to a disorder that is added to another, and not equally to a succeeding one: therefore, it was not without some hope that I attempted the cure of my insane patient; though, by reason of what he had before suffer'd, I could not pursue that practice which is recommended by the celebrated Borelli, to use a bath of sweet water, or venæsections; especially as the face and eyes were not red in this patient, nor the motions of the arteries very much quicken'd. Nor could I follow another method, propos'd by Sydenham, to use warmer remedies, and keep the belly costive: for bilious matter was discharg'd from the intestines, though not so frequently, nor any longer attended with tormina; and I was so far from thinking, that this would injure the patient, that I even hop'd, according to the aphorism above-mention'd, that it would be likely to be of service. Therefore, instead of venæsections, I order'd cupping glassies to be fix'd down to the lower limbs, without scarification, and then to be pull'd away; and such things to be laid upon the head, as are said to be sedative, and promote sleep; and sometimes even composing medicines to be given at the beginning of the night, in such a manner however, as always to have regard to the strength of the patient, and the preservation of the discharge by stool, which I had determin'd not to check. And when I had, by means of these medicines, procur'd some little rest, and saw that the delirium was, in consequence thereof, more mild; this was the only disagreeable circumstance on the following days, that the discharge from the intestines was stopp'd. For either there was some hope, that by this way the matter might at length be entirely eliminated from the body, which had kept up the disorder so long, and in so many shapes: or, as other ways had been before attempted in vain, it remain'd, that I should prepare a new one, by bringing on an ulcer, if possibly that matter could be expell'd by this way, which could not be expell'd by others; suppose "some kind of virus, or I know not what malignant stimulus;" for that, if we believe Ballonius (*b*), "any sudden change, or transition, of one disease into another, is a proof of." Therefore, as the purging of the belly did not last above one day, and afterwards its dis-

(*a*) Cent. 4. obs. 42.

(*x*) Membr. 3. cit. supra ad n. 7.

(*y*) 5. f. VII.

(*z*) Not. ad eum aphor.

(*a*) Comment. l. 6. in Coac. f. 2. a. 30.

(*b*) Epidem. l. 2. ad ver a. 1578.

charge was like that of a person in health, and the encreas'd quantity of urine, though thick, was of no advantage; I open'd that new way in one arm, by applying a caustic thereto; and by this drain, a great quantity of humour being soon carried off, and continuing to be discharg'd for some days, the patient was all this time more quiet; so that he could rise, and walk about the house, without any danger to himself, or to others. Yet he was less restor'd to his senses, than was necessary for him; for he would not suffer that the fore in his arm, which it was necessary to keep open some time longer, should be any more at all touch'd by the surgeon. When, therefore, the ulcer was almost heal'd, and his mind was not yet sufficiently calm and steady, nature brought in that assistance which I had before wish'd. For a great quantity of bilious matter flowing down by the intestines, he was, after the beginning of November, freed at once from the remainder of his madness, and from the danger of a new disorder. For although, when he was left to his own discretion, a little afterwards, and for that reason walk'd and ate more than was necessary, his legs were again a little swollen, yet this swelling easily went off, as soon as ever he kept himself temperate in these two points.

Thus you have all that I, who was then a young man, was able to observe, to act, or to think, in a particular instance, relating to the successions of diseases; a subject, doubtless, very useful to physicians, and for that reason attempted by Baglivi (c) in his very outlines, and nevertheless much wish'd for by him, by Reusnerus (d), and by others, supposing that till their time no-body had ever attempted to treat of the subject. Yet that Prosper Alpinus did enter upon this subject, these words of Boerhaave shew (e): "I wish we had this book of that same Alpinus," *De variis permutationibus morborum*. And that Stephanus Rodericus Castrensis publish'd a little work upon this subject, entitl'd, *Quæ ex quibus*, our very celebrated Gianella (f) has inform'd us; who did not, for that reason, think it was superfluous in him to treat of the same subject learnedly and distinctly; especially as that little work of Castrensis (which was divided into four books, and went through four editions, in the former age, as you will see in *Lindenius Renovatus*) was so difficult to be found, that he sought it in vain, though he us'd all possible diligence in the search. I happen'd, however, to light on it lately. But the too prolix narration in regard to the young man, who, after such a long succession of disorders, being at length maniacal, recover'd his former health and sanity, in a short time, prevents my saying any thing on that head now. Let us, therefore, return to the dissections of those patients who died insane.

11. In the latter end of the year 1723, I diligently dissected the head and neck only, of a man who had long been disorder'd in his senses, and who had been taken off in the hospital at Padua by a slow fever. Among the circumstances that occur'd in this dissection, I shall now only mention such as relate to the present subject. In the neck, I found the carotid arteries, and internal jugular veins, wider than natural. The upper part of the skull being taken away, there was water under the meninges; but none was contain'd in the

(c) Specim. trium reliquor. libror. de Fibra
Motr. c. 1.

(d) Eph. N. C. cent. 5. obs. 8.

(e) Prælect. in Inst. § 942.

(f) De Successione Morbor. l. 1. c. 1.

ventricles; and consequently, none between the two lamellæ of the septum, by which those ventricles are divided from each other. Yet I found the cerebrum hard, though it was the fifth or sixth day after death. The cerebellum, on the contrary, was flaccid and soft.

12. We had the same parts of another maniacal man to dissect in public, in the year 1734. In the neck, an appearance was found which deserves to be taken notice of here, on account of its rarity, though it does not relate to the present purpose. The musculus sternothyroidæus, on each side, was entirely wanting; for which reason, the hyothyroidæi, not only on the inner side, but on the exterior also, extended themselves to the basis of the scutiform cartilage, taking up that space, which from the upper and contracted part of the sternothyroidæi, on the surface of the cartilage above-mention'd, us'd to be vacant, as I have already (g) explain'd and describ'd. And as I look'd upon this surface attentively, after the muscles were rais'd, and compar'd it with other larynxes, which were at hand, I saw that it had a much less prominence than those on that part of the cartilage, where these muscles are wont to be inserted. Besides these variations, I could not see any other in the remaining muscles and cartilages, that belong'd to the larynx, or in the adjoining trunk of the aspera arteria. For although, when I demonstrated these appearances in the theatre, I attributed, in some measure, to the cricothyroidæi and sternohyoidæi muscles, the office of supplying the place of the others that were deficient, and they were in fact large and strong; yet they did not seem to be proportionably stronger and larger than usual. And whether this man, when living, had any thing in the motion of the larynx, which was worthy of peculiar attention, I could not possibly inform myself, nor yet of what disorder he at last died.

In the brain I observ'd the vessels to be distended, which might also be owing to the last disease. But as to what relates to the madness, the substance of the cerebrum itself was in general hard; whereas some internal parts, and among these the fornix, and pineal gland, were extremely lax. Besides, this gland was very much shrunk, and had a slight yellowish tinge mix'd with the brown, which was its general colour. And that there was some water under the pia mater, is sufficiently prov'd, I think, by this circumstance, that the membrane we are speaking of could be very easily drawn off from the cerebrum, cerebellum, and medulla oblongata.

13. If you join these six dissections of mine with that which I describ'd to you in the first letter (b), and compare them all with those you have in the Sepulchretum, or other books, you will immediately perceive, that among those things which others have observ'd, some of them have been never found by me, a few rarely, many often, and others indeed always. For example, that I did not find, even in the man who was in like manner believ'd to be made mad from a philtre, the pia mater not "insinuating itself (i)," as usual, "between the convolutions of the brain," my silence on this head, in the history of the butcher (k), plainly shews. And that I never saw worms in the brain, and indeed never expected to see them, the first letter sufficiently

(g) Advers. 1. n. 6. & Tab. 1. ad litt. g
dexteram.

(b) N. 10.

(i) Sepulchr. l. 1. f. 9. in Addit. obs. 1.

(k) Supra, n. 6.

shews (*l*): and for this reason I am the more displeas'd, that the passage which escap'd Riolanus (*m*) should be transferr'd into the Sepulchretum (*n*), which is this, "Does the worm which is generated in the brain, and is the cause of madness in a horse, owe its origin to a putrefaction of humours? or does it arise from a vermiform apophysis of the *cerebellum*, degenerating into a worm?" Yet, certainly, I never saw any other things, which were more worthy to be added to the Sepulchretum. Baglivi (*o*) affirms, "that he had dissected two maniacs at Naples, and that he had found the dura mater hard, as a piece of board, and almost dried up." Although it was not there necessary, that Willis should argue in these words, "He ought to have investigated, and examin'd, in those maniacs, the state of the meninges, for he would have found a difference;" yet in those I dissected, I certainly know that there was not any: and even as to that appearance, which I describ'd in the first letter (*p*), as being found in the dura mater, the disorder was not, I think, to be referr'd to this kind, that Baglivi and Willis take notice of, as it was contain'd within a certain small space. Yet, since them, two very experienc'd men, Littre (*q*) and Geoffroy (*r*), each of them, found both the meninges diseas'd, in separate maniacal patients: in the one, it was more compact; in the other, it was more thick and firm: not to say any thing of the falciform process, which Geoffroy saw at the same time, almost every where cover'd with bony laminæ, or plates. And this firmness or thickness of one, or both, of the meninges, in maniacs, has been remark'd also by others, as you will read in Alexander Camerarius (*s*), and the celebrated Van Swieten (*t*): and I should, perhaps, be ready to believe that this appearance was brought on by long and violent deliria, if I did not know that the same had been seen by Wepfer (*u*), and even after melancholy deliria by King (*x*), after foolishness or idiotism by others (*y*), and even by myself (*z*) in those whose understanding had been perfectly sound. Yet I see, that this is much less rarely to be found, than those large kinds of glands in the interior parts of the brain, which are describ'd in the observation of Valsalva (*a*); although at the same time I know, that, in two melancholic persons (*b*), appearances, in some measure similar to these, have been found in the same places. Nor have the same things ever occur'd to me, which have occur'd to Santorini (*c*), in two old men, one an idiot, and the other slightly disorder'd in mind; I mean, foveolæ, or little pits, fill'd with lymph, or a yellowish little body in the medullium of the brain: and still less what Willis (*d*), Kerckringius (*e*), and King (*f*), have seen, the bulk of the brain much less than it naturally is.

14. But rarely, and indeed only once, have I seen, in the dissection of in-

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| (<i>l</i>) N. 8. & 9. | (<i>u</i>) Auct. Hist. Apopl. hist. 15. |
| (<i>m</i>) Anthropogr. l. 4. c. 2 | (<i>x</i>) Act. Lips. a. 1688. m. Maj. |
| (<i>n</i>) L. 1. f. 8. obs. 5. § 3 | (<i>y</i>) Vid. Sepulchr. l. 1. f. 1. obs. 1. |
| (<i>o</i>) Specim. l. 1. de Fibra Motr. c. 5. coll. 10. | (<i>z</i>) Epist. V. n. 6: & Epist. XLIX. n. 16. |
| (<i>p</i>) N. cit. 10. | (<i>a</i>) (<i>b</i>) (<i>c</i>) Supra, n. 2. |
| (<i>q</i>) (<i>r</i>) Mem. de l'Acad. R. des Sc. a. 1705, & 1706. | (<i>d</i>) Wepfer. Hist. cit. 15. & Hist. de l'Acad. R. des Sc. a. 1700. |
| (<i>s</i>) Disp. de apofpasm. Fibæ Matr. | (<i>e</i>) Obs. Anat. c. 3. § 6. |
| (<i>t</i>) Comm. in Boerh. Aphor. 1121. | (<i>f</i>) Sepulchr. l. 1. f. 10. obs. 3, 9, 10. |

sane persons, those deep sulci in the corpus callosum, or the aerial bubbles in the sanguiferous vessels of the brain, and the medullary substance thereof brown (g), most of which, I suppose, are merely accidental in disorders of this kind; and I have certainly describ'd them to you in others who were not insane. Nor do I see that they have been observ'd in those by others: nay, Lancisi (h) remark'd in an idiot, that the substance of the brain was "more white than natural;" as he also remark'd some things different in the corpus callosum. On the other hand, I have often seen the vessels of the brain distended with blood, and more often, water under the meninges, or in the ventricles; nor perhaps should rarely have lit upon an enlarg'd or schirrhous spleen, if I had always had time to examine the viscera of those whose brain I dissected. All which the celebrated Hoyerus saw, at one time, in the body of a maniac (i): and Van Swieten (k) saw the vessels distended "with a very black and pitch-like blood," in a melancholic woman; as that very skilful anatomist Phil. Conrad. Fabricius found the plexus choroides "frequently turgid and inflated," in maniacs (l): and a quantity of extravasated water not only in an idiot, King (m), and others, but also in a melancholic woman, Wepfer (n); and in maniacal persons, those who are mention'd with honour by Van Swieten (o), who thence explains the aphorism which we have mention'd above (p), if a dropsy comes on after madness, 'tis a good sign, by supposing that the water is reabsorb'd from the brain, and carried to some other part. And finally, Hoyerus (q), when he tells you that he had found schirrhous spleens, in some bodies, after intermittent fevers, says, "that such subjects had, for the most part, been previously affected with "grievous melancholic deliria." I am not, however, ignorant, that in three persons, who were so delirious from melancholy as to put an end to their own lives, the spleen was neither large nor hard, and even in one of them was much less than it should be (r); and that the excellent Heister (s), who dissected two of them, had rather observ'd morbid appearances in the pancreas and bile. Which observations, although all of them are worthy to be inserted in the Sepulchretum, yet I would have you observe in regard thereto, how many particulars they in general contain, which are common to other disorders also. And for this reason I cannot help the more wond'ring, that in those histories of maniacal and melancholic persons, which are given you in the Sepulchretum (t), though the greatest part of these disorders, and even those which are more common, be frequently repeated, yet these two are scarcely once taken notice of; the first of which has very frequently, and the other, in fact, always occur'd to me, in the dissection of patients who had been disorder'd in their minds. For hitherto, I have four times found diseases of the pineal gland (u); and seven times, that is always, the hardness of the cerebrum. And that you may not suspect this to have happen'd by some

(g) Sepulchr. l. 1. f. 10. obs. 5.

(h) Diff. Var. VII.

(i) Act. N. C. vol. 4. obs. 39.

(k) Comm. cit. ad § 1010. 2. vers. fin.

(l) Idea Anat. Pract. Sect. 4.

(m) (x) Locis cit.

(o) Comm. cit. ad § 1124.

(p) N. 10.

(q) Act. N. C. vol. 5. obs. 68.

(r) Eph. N. C. cent. 7. obs. 60.

(s) Earund. cent. 6. obs. 28.

(t) Cit. sect. 8. & 9.

(u) Vid. etiam epist. l. n. 10.

accident or other, I will immediately subjoin another history, communicated to me by my friend Mediavia, on the second of January, in the year 1729. For on this day, being so taken up with other avocations, that I could not be present myself, I committed the whole dissection to his well-known diligence and skill.

15. A man, who was delirious, without a fever, through the imprudence of those who had been his very diligent keepers for many days, leap'd out of bed, in the night, in such a manner, that dashing his head vehemently against the wall, or against the floor, he immediately died thereupon. The skull and the cerebrum shew'd no peculiar marks, which were the effects of the blow. There was a little water betwixt the meninges: in the right and the left ventricles, there was so far from being a little, that they were half full; and the water which was contain'd in them, had a mixture of red and yellow. The plexus choroides were red; the remaining vessels also were fuller than usual with blood; and the coats of the arterial tubes were more firm and strong than they naturally are. The dura mater was thicker than it generally is. At the anterior basis of the pineal gland were those hardish little bodies. But what seem'd the most worthy of remark, although the cortical substance of the cerebellum was surprisngly lax, and that of the cerebrum itself a little softer than usual; and although the medullary portion, which is envelop'd in the cerebellum, as also the protuberantia annularis, were somewhat, though not extremely hard; the beginning of the spinal marrow, and the whole medullary substance of the cerebrum itself, were extremely hard.

16. Add the encreas'd thickness of the dura mater to the observations of others, a little before (x) taken notice of; but the disorders of the pineal gland, and the hardness of the cerebrum, to mine, and to those of some learned men. And very few things occur at present, indeed, on the subject of the pineal gland. For Diemerbroeck (y), although he points out many observations, that have been made by others, of sand and calculi being found in that gland, yet he, at the same time, denies, his having read in any of those authors, in like manner, that in these persons, where such appearances were found, "an inconvenience had happen'd in respect to the animal actions:" and I contend, that they were not all maniacs, or melancholic persons, in whom I have seen this disorder, but that, on the contrary, many had labour'd under other disorders, as the former letters (z) sufficiently prove. But these things I say: first, that although, as Santorini (a) has said, "it is now manifest among anatomists, that concretions of this kind are sometimes found;" yet that in no other part of the brain, which he ought to have observ'd, are they so often found: next, that though they are often found in this part, yet it has so happen'd to me, that I have more often seen them in persons who had been disorder'd in their minds, than in those who had been afflicted with any other kind of disorder whatever. And he was certainly an idiot, in whom Edmund King (b) found the gland become

(x) N. 13.

(y) Anatom. 1. 3. c. 6.

(z) V. n. 11. & VI. n. 12.

(a) Obs. Anat. c. 3. n. 8.

(b) loc. cit. supra, ad n. 13.

stony; as the patient also was stupid, from a surprising loss of memory, in whom Berlingerius Gipseus (*c*) saw the same appearance. Last of all, I say, that besides this, there are other diseases of the pineal gland, and those also found in some persons, whose minds had been disorder'd; one, for instance, which Lancisi observ'd, in the same idiot whom we spoke of above (*d*); that is, such an amazing smallness, as in a man of sixty-six years of age, "scarcely " to equal a seed of hemp in its size." And not far different from this was that which I before describ'd to you (*e*), as being very much shrunk, and at the same time very lax, in a man whose mind had been disorder'd. But another disorder, and one which is quite different from this; so far even, that if you consider its very great laxity in the former case, it is altogether opposite thereto, you have in the Sepulchretum (*f*): this disorder was remark'd by Theodorus Zwingerus, and was of such a kind, that the gland "was universally red, and much more solid than usual."

17. And though there is no more than one observation extant in the whole Sepulchretum, as I have in like manner hinted above, of that appearance which has always been found by me, in persons disorder'd in their minds; I mean that of Henricus ab Heer (*g*), who, in a man that had been maniacal, found the brain to be hard; yet other examples are not wanting, which might with justice be added. For first of all, those gentlemen of the Royal Academy of Sciences at Paris, whom I have already commended (*b*), Littre and Geoffroy, found in the two maniacs, spoken of above, that the substance of the cerebrum also was much more firm than it us'd to be; whereas the cerebellum was almost of its natural softness: and even in that very idiot, whom I have once and again made mention of (*i*), Lancisi observ'd "the whole substance " of the brain to be more compact than usual," and the corpus callosum itself "to be, in like manner, pretty hard." To these we must also add Santorini (*k*), who, in an old man that was an idiot, not only found other appearances, but also found the cerebrum "much more firm than this part " is accusom'd to be;" so that "he could, by reason of its greater firmness, more conveniently, and perspicuously, enquire into, and distinguish " some appearances," which I also, for the same reason, had done before, and have done since, as is already related (*l*). And Boerhaave (*m*), perhaps, animadverted to other histories, which had fall'n under his notice, when he asserted, "from anatomical dissections, that the cerebrum of maniacal persons was dry, hard, friable, and yellow in its cortical substance." But although even Geoffroy (*n*) describ'd a great dryness of the brain; yet out of all the observations which are known to me, that only comprehends all those circumstances, which, as I said it was the only one that mentions the hardness of the cerebrum in the Sepulchretum; so I observe it is the only one out of all I remember to have read, which very usefully teaches, that the same cerebrum was, nevertheless, "considerably soft and moist about the

(*c*) Apud Contulum de Lapid. Podagr. &c.

c. 5.

(*d*) n. 14.

(*e*) n. 12.

(*f*) Obs. 1. Sect. cit. g. in Addit.

(*g*) 1. in Sect. 8. quæ 5. est in Sect. 4.

(*b*) loc. cit. supra ad n. 13.

(*i*) n. 14 & 16.

(*k*) c. cit. n. 6.

(*l*) supra, n. 6.

(*m*) Aphor. de cognosc. morb. § 1121.

(*n*) loc. cit.

“basis and the ventricles.” And that all parts of the brain are not found to be of equal hardness in maniacal or melancholic persons, and that even some are more soft sometimes than they ought to be, the dissections which I have describ’d to you, when compar’d one with another, sufficiently shew.

18. But although, probably, it was not owing to mere chance, that as in the insane persons whom these worthy men dissected, so in all these who were examin’d by me, there was a hardness of the whole cerebrum, or certainly as I always found, at least a hardness of the medullary substance of its hemispheres; and though I think that the circumstance is not to be neglected, by any means, yet I do not believe, that so much is to be attributed to it, that we should ascribe disorders of the mind to this, as to their only cause, and prove our hypothesis by very subtle and specious explications: which would not be wanting on this occasion, as we might, in the first place, for instance, enquire, whether this hardness be brought about by dryness; that is, by a less quantity of moisture flowing in upon its substance; or whether it be the effect of some austere and astringent juice; and finally, whether such a hardness being brought on, from any cause whatever, is an obstruction to reason and understanding, either by freight’ning some very slender and narrow passages, or by so straining the fibres, that they tremble at any very slight motion much more than they ought; or by rend’ring them so flexible, that they are never agitated but at certain motions, and then always in the same manner. But these, and other such inextricable disputations, I have avoided being drawn into, as I would being drawn into snares; and for that reason, have of choice made remarks of any other kind upon the histories propos’d, rather than fall into hypothesis and conjecture. And that you may understand, why I do not lay so much stress upon this hardness, I would have you know, that in some persons likewise, whose minds had not been disorder’d, I did not find the cerebrum less hard than in these: as in one who died of an inflammation of the thorax; and in another who died of a fracture of the thigh; and in a very old man also, whom age itself, rather than diseases, had gradually brought to his end.

But because that excellent anatomist Haller (*o*) has asserted, “that the brains of old men, even from the testimony of the knife, are harder than others,” and thinks that from thence “their weakness of memory and understanding” is to be accounted for; let us set aside this very aged man, and you can remember, that when I related the dissections of apoplectic persons to you, I mention’d, that the cerebrum of the woman, who had thirteen ribs on each side, was of an amazing hardness throughout its substance (*p*); and in like manner, of a very remarkable hardness in the ostler (*q*), in whom indeed it was so great, that whereas I dissected his brain not many days after I had examin’d the brain of that second insane woman, as above describ’d (*r*), I easily observ’d, which I then expressly remark’d in the Adversaria, that his brain was altogether equal in hardness to her’s. Yet neither of these apoplectic patients were decrepid.

But the same or similar appearances have occur’d to others, in a much

(*o*) Ad Prælect. Boerh. § 475. not. g.

(*q*) Epist. 4. n. 19.

(*p*) Epist. 5. n. 6.

(*r*) N. 9.

less age, sometimes. Let it suffice to mention two or three, Phil. Conrad. Fabricius, Littre, and Fantonus the elder. Fabricius (*s*), in a woman of a middle age, who died suddenly, when she seem'd to be very well, found "the substance of the cerebrum so firm and dry," that he thought it worthy of remark. And Littre (*t*), in the body of a young man, who was a condemn'd criminal, found the substance of the cerebrum, cerebellum, and medulla oblongata, to be, both to the eye and to the touch, more dense and compact than usual. This young man, to avoid the indignity of public execution, ran violently with his head against a wall, by the dash of which he immediately kill'd himself, just as the madman did, whom I gave an account of in the last history (*u*); the internal cause of whose death, not coming much more under the notice of the senses, than that of this criminal, you might have conjectur'd, from the account which Littre has given, if the same things had been observ'd in both cases, and he had not endeavour'd to account for it, from that hardness, as if produc'd by the blow. But Fantonus, even in a tender infant, who had been carried off by convulsions (*x*), found "the medullary substance and medulla oblongata" very hard: and what conjectures, and with what modesty and caution, his excellent son has made concerning the causes of this, it will not be altogether foreign to the present purpose to inform yourself from the scholium, which he not only subjoin'd to his father's observations at first, but even upon a revival of the work. You, therefore, sufficiently understand, that the brain may be hard, without the senses being disorder'd: and you may likewise add, that there may be a disorder in the senses, without hardness of the brain. For neither in idiots only, dissected by Tulpus (*y*), Kerckringius (*z*), King (*a*), and Scheidius (*b*), was the cerebrum lax and flaccid; but the last of them says, "that this generally is the case in those who are depriv'd of their understanding, as we also frequently find it in maniacal persons." And although this differs from our observations, according to which we think that the hardness of the brain is not to be neglected in this species of disorder, yet it is one reason why I am by no means sorry to have determin'd (*c*), that this appearance is not solely, or chiefly, to be attended to.

19. But now I will add what relates to the hydrophobia, as I promis'd in the beginning. Although since Salius (*d*), Cæsalpinus (*e*), Codronchius (*f*), and Aromatarius (*g*) had affirm'd, that many have the hydrophobia without delirium, a number of scatter'd histories, besides those which I shall now produce (*h*), came forth, that prov'd the observations of those very excellent physicians; and even although Theodorus Zwingerus (*i*) has so distinguish'd the hydrophobia from the rabies, that he not only asserts the former may happen without the latter, which is true, but has asserted, that the latter

(*s*) Propemptic. ad diff. J. B. Hoffman.

(*t*) Hist. de l' Acad. R. des Sc. a. 1705.

(*u*) Supra, n. 15.

(*x*) Obsev. Anat. Med. 20.

(*y*) Sepulchret. l. 1. f. 10. obs. 16.

(*z*) Ibid. obs. 5.

(*a*) Ubi supra ad n. 13.

(*b*) De dub. officul. & c. qu. 4.

(*c*) Vid. etiam epist. 61, n. 8.

(*d*) De Affect. Particularib. c. 19.

(*e*) Art. Med. l. 3. c. 34.

(*f*) De Rabie, l. 1. c. 1.

(*g*) Disp. de Rab. p. 2. partic. 1.

(*h*) Infra, n. 22, 23.

(*i*) Eph. N. C. dec. 3. a. 2. obs. 104. in schol. addita postea extra ord. Sepulchr. l. 1. f. 13. in fin.

can never happen without the former, which is not equally true; yet because Bonetus, who nevertheless gives one observation of the hydrophobia, in which the senses were unhurt (*k*), chose rather to follow those, who had plac'd this disorder, long ago, among the species of madness, and added the dissections of persons, who labour'd under the hydrophobia, to those of the maniacal patients, I will not here recede from his order; especially as I must confess that a delirium, either maniacal, or melancholic, is frequently join'd to the hydrophobia; or at least a delirium compounded of both: and that a mania may be join'd with a hydrophobia, the illustrious Mead (*l*) confirms, who saw a man labouring under this disorder, "have the strength of his muscles so prodigiously increas'd, that in his presence he broke through, at one attempt, all the ropes with which he was tied down in his bed." And others also (*m*) have given an account of a young man, who was at times so furious from this disease, "that he could scarce be held quiet by four men:" and still others (*n*) of a boy, of five years of age, "whose fury a very strong man was not able to restrain. And these things I have hinted, in order to show you, that there may, and even must be, great differences between the dissections of patients who labour'd under this disease, according to the variety of the symptoms with which they are afflicted; for many who have a hydrophobia, are so far from having any delirium, that they have not even the least traces of fever, as appears from the observations of almost all the gentlemen here commended, and others. For I would not have you imagine, that this symptom of dreading water, and yet being thirsty, is a delirium; neither that all do dread it: since some of them do order it to be brought to them, and endeavour to drink. Yet they do not generally drink, and that for very sufficient reasons. For some having endeavour'd to swallow gradually, even the smallest portion of liquor, did it with the greatest uneasiness and pain, as the boy whom Mead gave an account of, to the Royal Society (*o*) at London: but others being either worse, or having drunk more, have been seiz'd with violent convulsions, or instant suffocation arising from thence, and immediately died. And the former of these accidents happen'd to a virgin of Modena, whom I shall speak of below (*p*); and the latter to those that Avicenna (*q*) has mention'd, who, speaking of the patient in a hydrophobia, and of water, writes thus: "And sometimes he swallows some of it, for which reason he is thereby suffocated, and dies." But others, who have been ask'd, whether they were perfectly in their senses, why they did not drink, have answer'd that they could not, by reason of the great constriction, and narrowness of their fauces, or gula; as Salius (*r*) testifies, and Aromatarius confirms (*s*). And, indeed, in those parts, they do in reality seem to have some obstruction to the swallowing of liquor; so that Cæsalpinus (*t*) compar'd them with "some patients, who labour under an angina, in whom what is drunk, returns by the nostrils," and did

(*k*) 8. in S. 8. 1. ejusd. 1.

(*l*) Tract. de Venen. Tent. 2.

(*m*) apud Swieten. Comm. in Boerh. Aph. 1137.

(*n*) Eph. N. C. Cent. 7. obs. 54.

(*o*) Saggio delle Transaz. Filof. p. 2. c. 8.

n. 3.

(*p*) n. 29.

(*q*) Canon. 1. 4. F. 6. tr. 4. c. 7.

(*r*) c. 19. cit.

(*s*) P. cit. partic. 7.

(*t*) c. cit.

not doubt, "but that the gula in them was spasmodically drawn together." Which passage being read by Aromatarius (*u*), it seem'd very wonderful to him, that neither Salius, nor Cæsalpinus, had by any means infer'd, what he thought he could not help concluding from thence; I mean, that this disorder "was nothing else but a kind of angina."

20. From that time to this, there have been more observations publish'd, relative to the disorder itself, than to the dissection of the bodies after death. Yet among these latter, some seem to favour the opinion of Aromatarius; as that which was made by Th. Zwingerus (*x*), who saw "the membranous interstices of the cartilaginous circles of the aspera arteria very intensely red;" and still more, that which a surgeon related to Mead (*y*), of the fauces being greatly inflam'd; and that which was made by Taurvy, and related to the Royal Academy of Sciences at Paris (*z*), of the gula being inflam'd, and the aspera arteria in some measure also. Although the two former likewise mention'd the lungs being partly or entirely full of blood, effus'd into the vesicles; and this blood, Zwingerus also writes, was concreted in the heart, and the large vessels that were about it; and that the intestines, moreover, but especially the stomach, were distinguish'd with red spots. But Taurvy, although he observ'd none of these things, yet remark'd almost all the others, which, together with a part of these, you may see recounted by Boerhaave (*a*). On the other hand, there is a dissection against Aromatarius, made by Mead, upon the boy spoken of above (*b*); for having examin'd the throat, brain, thorax, and stomach, he found no where any thing that was unnatural, except a large quantity of green and viscid bile, in the last-mention'd cavity. Those things may also seem to be repugnant to this doctrine, which you will find hinted in the Sepulchretum (*c*), and expressly oppos'd to "a physician of great name," (that is to Aromatarius, as I suppose), "who refer'd this disorder to an inflammation of the fauces, and a kind of angina join'd therewith." "But the bodies, when open'd," which Rolfinck, in consequence of these observations, immediately subjoins, "shew'd no signs of inflammation." Aromatarius, however (*d*), as he was very well vers'd in the reading of the ancient physicians, had studied to avoid many of the objections which might be made to him, under colour of their authority, by contending, that a disorder which is in any part of the gula, or trunk of the aspera arteria, and even sometimes that which is not acute, or attended with a fever, is to be consider'd as an angina; inasmuch as it consists in any streightness or obstruction of those passages, if it happen from convulsion only, or purposely to omit other things, from mere phlegm occupying the passages, without any concomitant inflammation. And although, as you see in the same Sepulchretum (*e*), he seems to determine the angina, attending the hydrophobia, to this last species of the disorder, or that which occupies the larynx; yet taking even this for granted, he sufficiently avoids the observations of Rolfinck. But if you do not make thus short of the matter,

(*u*) Partic. ead. 7.

(*x*) Obs. cit. 104.

(*y*) n. 3. cit.

(*z*) Hist. A. 1699.

(*a*) Aphor. de cogn. morb. § 1140.

(*b*) n. 19.

(*c*) l. 1. S. 8. obs. 10.

(*d*) Disp. cit. p. 3. partic. 1 & 4.

(*e*) Addit. ad S. cit. 8. obs. 1.

you will also believe, that the observation of Brechtfeld, which you have soon after, in the Sepulchretum (*f*), is likewise favourable thereto, as he found "the whole tract of the œsophagus very narrow, and in a manner "constricting."

21. But although it may at first seem very commendable in Aromatarius (*g*), that from the most obvious symptom, of all those which attended the hydrophobia, he propos'd ascertaining to himself, the nature and seat of the disorder; yet I would not have you suppose, that I shall readily embrace his opinion. Nor do I say this, because, if that were granted, it would not be understood, why patients, who labour under a hydrophobia, swallow food without much difficulty, and even some with none at all, as Cæsalpinus (*b*) and others have seen; or, as the excellent Brechtfeld says, "take down readily any kind of solids whatever;" for many have fall'n into this difficulty, besides Salius (*z*) and Aromatarius (*k*); as it takes place also in some other cases of injur'd deglutition, where the hydrophobia is not at all in question. I say it, therefore, rather for other reasons, which he also saw, but did not sufficiently explain; and especially on account of that admirable power, which is join'd therewith, of propagating itself by contagion, after a long interval of time. For it is very certain, though Salius (*l*), and with him others, did not believe it, that a very violent hydrophobia has been generated without any bite, even only from the saliva falling on the naked skin (*m*). It is also certain, that this virus, being insinuated into any part of the body, may often lie latent for a long time, sometimes even for twenty years (*n*), not to say forty (*o*), without any injury; till being excited by some cause, whatever that may be, it break forth, and be carried, from the part originally affected, to others, and others, till certain destruction is the consequence. And that it lies hid in this place, seems to be shown by that symptom which precedes the appearance of the disorder, and which Salius (*p*) formerly observ'd, "as the "chief and infallible sign, and unknown to all;" that is to say, "a certain "pain beginning in the part that had been bitten," and was now heal'd; which arising from thence, extended itself "from part to part," and in a short time to the brain, according to his observation; or at least upwards, suppose from the hand to the axilla, according to Zwingerus (*q*) and Scaramucius (*r*). But whoever saw an angina communicated by the saliva of a person affected therewith, falling upon the skin of those who attended him? and much less its fomes, if it could, by chance, ever have been communicated, lying torpid, and inactive, for a long time, in any certain part, and at length exerting its influence therefrom? For the incapacity of swallowing liquids is by no means the proper sign of the hydrophobia, unless join'd with other symptoms, and especially with the power of propagating itself. For the hydrophobia is a peculiar species of angina, arising from a peculiar species of

(*f*) Ibid. obs. 2.

(*g*) Disp. cit. p. 2. partic. 6.

(*b*) c. cit. (*i*) c. cit.

(*k*) Disp. cit p. 4. partic. 2. (*l*) c. cit.

(*m*) Eph. N. C. Dec. 1. A. 6 & 7. obs. 142. Vid. & Ejusd. 61. n. 13.

(*n*) Dec. ead. 9. A. 9 & 10. obs. 43.

(*o*) Vid. Gasp. a Reies Elysi. jucund. Quæst. Camp. qu. 61. n. 11.

(*p*) c. cit. (*q*) Schol. cit.

(*r*) Eph. N. C. Dec. 3. A. 9 & 10. in Append. n. 6.

poison. Whoever, therefore, professes to have found out the nature of this disorder, must demonstrate the nature of this poison. But I do not even see, that the seat of this disorder is confirm'd. For although Aromatarius (s) says, that the situation which he assign'd to it, "might very easily appear "from dissection;" yet he does not produce the least anatomical example of his own, in behalf of such an assertion: and it was not in his power to produce examples from others, since even at his time, as far as I know, no dissection of a person, affected with a hydrophobia, was extant, except that of our countryman Cappivacci, of which an account is given in the *Sepulchretum* (t). And those dissections which have been made since, are the same we have pointed out above; and if you receive the doctrine of angina, in a confin'd sense, you will see how far they favour it, or whether they favour it at all: but if you even suffer it to have its most extensive signification, I fear that the advantage of so general a doctrine will be much less than sufficient to satisfy our present purpose.

22. What then is the case? I really doubt, that in proportion to the abstruse nature of so very violent a disease, we have not yet had sufficient dissections to determine any thing from (u); and I am very sorry, that it has not yet been in my power to dissect the body of a patient who died of this disorder, and even the bodies of many, as the occasion would amply require; either because I was not permitted to do it, or because, when I had it in my power in other respects, I was prevented by ill health, or by the most important business, which seem'd to arise from a certain fatality in my affairs. For first I saw a boy at Bologna, about twelve years of age, who after more than forty days from the time that the dog had bitten him, in that part whence the danger is far more speedy and fatal than from all other parts, I mean the face, and even in the cheek, being seiz'd with this most lamentable disorder, became just like a furious person, anxious, crying out, red in his face, and not able to stand still in any place; yet he was at the same time sensible, and for that reason hurt no body, but dragg'd his father about the city with him, who in vain endeavour'd to hold him by his hand. But if any one offer'd him water, he endeavour'd with all his power to avoid it, saying that he should certainly be suffocated therefrom. This boy did not live more than twenty-four hours after the appearance of the disease: but I was not permitted to open his body; nor that of another boy in this place, who did not live even twenty hours after the time in which he first began to have an aversion to water. It was five months before his death, that he had been bitten in the leg by a dog; and as it was uncertain whether the creature had been mad, less care was taken of the wound, which however bore a very good appearance externally, and was therefore, without scruple, brought to a cicatrix. And when, after a short space of time, an ulcer had again appear'd in that very part of the leg, there was some reason why it should be imputed to other causes; for the boy having a scald-head, and being blotch'd with a kind of leprosy, and abounding with deprav'd hu-

(s) Disp. cit. p. 4. part. 2.

(t) S. cit. 8. obs. 7.

(u) Vid. tamen alias infra, n. 31. & Epist. 61. n. 9.

mours, was for that reason, if we are to believe Palmarius (x), and even Aetius (y), more liable to be seiz'd with a hydrophobia. In the mean while, he was suddenly seiz'd with an anxiety, and presently after, in the evening, a dread of water came on. In the morning, his lips were black, and his pulse almost entirely gone: and at noon he died.

On the other hand, I was permitted to dissect the bodies of two, who died of a hydrophobia; but my affairs, as I have already said, preventing me, I begg'd of my friend Mediavia, that he would undertake the dissection himself, and make report of his observations to me. I will subjoin both of the histories; and will add a third also, which was sent to me from Rome, by Jaques de Machy, a Parisian, a diligent and worthy man, who, in the way of his office, had often visited the patient, in the hospital of St. John in the Laterane, and had dissected him when dead. This worthy man, after attending my lectures some years, having departed thither, and loving me when absent, as he had diligently observ'd me when present, was there untimely taken off by a consumption, and left me almost inconsolable for his loss.

23. A man, who had been bitten some months before by a mad dog, was seiz'd at length with a manifest hydrophobia; and having medicines administer'd internally, water was also order'd to be pour'd upon his head. As he seem'd to be a little better for this method of cure, he was order'd to go into the bath. He not being delirious, and acknowledging that whatever was done, was done for his advantage, immediately set out to go thither, begging this one thing only of those who attended him, that as he would go in of his own accord, they might not plunge him in by force. But when he came there, he began to trifle and delay, and to say that he could by no means venture. Upon this, he was immediately thrown in, and held down, so that he drank the water. As he was then very earnest to be taken out, they took him out, and laid him in bed, where he remain'd very quietly. Not long after, however, he began to grow cold, and the next night he died.

Although the body was dissected at the sixteenth hour after death, and not later, and the season was more inclin'd to be cold, than it generally is here at that time, for it was the middle of September, in the year 1723; yet it had already so strong a smell, that it oblig'd the person who open'd it to make haste, and, having observ'd a very black bile in the gall-bladder, to carry away the viscera of the thorax, which were taken out, and the head, which was separated from the body, into an open place, where they might be very accurately inspected. The lungs themselves also smell'd very strong, and were black. The right auricle of the heart was extremely dilated, though not in consequence of what it contain'd; the left was very narrow: and in the ventricles were thin polypous concretions. The dura mater contain'd, within its sinusses, some concretions of the same kind; but easily soluble, and in a manner adipose. Beneath this membrane were some bubbles of air. All the vessels of the brain were full of blood; so that the choroid plexusses were black. There was no extravasation of serum. The substances of the cerebrum and cerebellum were rather dry than moist. The parts which remain'd besides these, were not inspected, for the reason before mention'd.

(x) L. de morf. canis rab. c. 2.

(y) Tetrabibl. 2. ferm. 2. c. 24.

This, however, was in general observ'd, that the blood was of such a kind, as to have a tendency rather to concretion than solution.

24. When the physicians order'd the head of this patient to have much water pour'd upon it, they perhaps had an eye to some successful cures, which had been perform'd almost after the same manner, as mention'd in the books of the Royal Academy of Sciences at Paris (z). That the patient went to the bath knowingly and voluntarily, is less to be wonder'd at, than that the boy taken notice of by Mead (a), when he was plung'd into the water, should deny that he was afraid of water, and should remain very quiet therein for a little while. At length, that the right auricle of the heart was found extremely distended, and yet not from its contents, I easily understand in this manner: I mean, that it was preserv'd in a state of distension by air, which probably could not be seen, as has sometimes happen'd in others (b); since in so great a corruption of humours, as that very grievous smell and blackness of the lungs demonstrated, the air might escape without difficulty from the other component parts of the blood (c); and this, the aerial bubbles found under the dura mater confirm'd. And in the same manner, perhaps, are we to understand those things, which we find written in the dissection of a hydrophobic patient by Brechtfeld (d): "The right auricle of the heart was amazingly swell'd: the right ventricle was full of grumous blood, and in "the left was a blood altogether fluid:" for why did he say what the ventricles, which were not tumid, contain'd, and yet did not say what the auricle, which was so greatly distended, contain'd? In regard to other things, which I have describ'd as being seen in the body just spoken of, I will consider them hereafter (e).

25. A man, who had a month before been bitten by a mad dog, was seiz'd with an evident hydrophobia. But this man was delirious, was continually crying out, and had a fever. Being once immers'd in water, when it was perhaps too late, and he was grown weak, he was scarcely taken out again, but he immediately exchang'd for death his every-way miserable life.

The body of this man, who had been afflicted with so grievous a disorder, even after more than twenty four hours, and in the hottest season of the year, that is, before the end of July, did not smell very strong. His face, indeed, seem'd like that of a patient, who died in the last stage of a consumption; but the remaining parts of his body were sufficiently fleshy and plump. His neck was so far ting'd with a livid colour, that even after much blood had flown out in dissection, it was still livid. The belly was tumid, from the stomach and intestines being fill'd with air; and though these viscera seem'd, in other respects, to be sufficiently natural, yet the vessels which creep through the stomach, were distended with blood, almost as much as when we see them fill'd by any injected liquor. In the stomach itself, beside air, was a water, partly yellow, and partly greenish. A great part of the liver was livid; but its vesicle was very full of bile, not black however, but brown.

The diaphragm was not altogether free from inflammation. The lungs, on their whole posterior part, were not only black, but even swell'n, from the

(z) Hist. a. 1699.

(a) Supra, 19, & 20.

(b) Epist. 5. n. 20.

(d) Supra, n. 20.

(c) Ibid. n. 29.

(e) N. 30.

blood,

blood, as it seem'd, stagnating in them; but they were not at all hard. The blood in this body was black, not polypous indeed, but by no means dissolved. The œsophagus in the thorax, and lower part of the neck, was found; but the upper part thereof, where it was near to the pharynx, and the whole pharynx, larynx, and aspera arteria, on their internal surfaces, were of a blackish red; so that they did not seem to have been inflam'd, only to have been very near to a gangrenous state: yet they were not swell'd, and the uvula even seem'd very small, although the tongue was very thick. And the pharynx, even to the posterior foramina of the nose, and the very roof of the mouth, was full of a yellow and greenish foam. Last of all, in the meninges, the vessels were extremely distended with blood; and the internal substance of the brain was every where distinguish'd with bloody points, and a kind of bloody filaments. In the lateral ventricles was a small quantity of serum, and that a little reddish.

26. That which was formerly recommended in the writings of Celsus (*f*), as "the only remedy" for this most violent disease, that the patient "be thrown into a pond of water," does not so often succeed with physicians, as you would perhaps believe, from seeing so many of them commended on this account by Etmuller (*g*). For if you turn to the observations of Forestus and Tulpus, to the "experience" of whom he appeals, you will find, that the plunging into water does not refer to the method of cure, to which that propos'd by Celsus refers, but only to the preservation from the disorder. And you will find, that the matter comes just to the same thing, excepting only one observation, of a kind of mad mule, if you consider "the many examples of dog-madness so cur'd," which are said to be extant in Schenck; and you will even perceive, that Schenck has produc'd that of Andrew Baccius (*h*), from which you will understand, that the disorder was not cur'd, but rather increas'd, by this method of treatment. And finally, in that chapter of Parey, which is refer'd to (*i*), the happy success of it is so far from being prov'd, that the inutility of the remedy is confirm'd. And although, in the chapter before (*k*), Aetius is said to have related of a philosopher, that "having immers'd himself in a bath, and drunk intrepidly "of the water," he came out sound and well; yet, if you examine Aetius (*l*), you will find that he did drink indeed, but you will not find that he plung'd himself into the water. Among so many authors, therefore, commended by him, Van Helmont only remains (*m*), who saw an old man, "labouring "under a hydrophobia, freed from his disorder," by being three times immers'd in the sea; to which example you will also add the cure of the girl, which you will read in the history of the Royal Academy of Sciences at Paris (*n*). Yet it must have succeeded very differently with others; since, beside Baccius, and him whom Parey (*o*) pointed out, the cardinal Pontzettus, not only Salius (*p*) has written, "that he, after several times experience, had

(*f*) De Medic. l. 5. c. 27. n. 2.

(*g*) Prax. l. 2. f. 3. c. 4. art. 4. m. 1.

(*h*) Vid. Schenck. l. 7. observ. med. 22.

(*i*) l. 1. 20. (*k*) 13.

(*l*) C. 24. cit. supra, ad n. 22.

(*m*) Demens idea. n. 47.

(*n*) A. cit. 1699. (*o*) Cit. c. 14.

(*p*) De Affect. Particularib. c. 19.

"found no advantage from this remedy," but also Cælius Aurelianus (g) expressly discommended it, as injurious. But Julius Palmarius (r) has admonish'd us, "that it was certain, from the experience of many, that this "method of treatment had been very unsuccessful." And left you should believe, that this might happen, because they had not us'd a pool, or pond, but the sea, as Palmarius tells us, it is certain, that Aromatarius (s) did not speak of the sea, when he said, "that this remedy of Celsus was a very "dangerous one, as it was wont certainly to suffocate the patient." What shall we say then? Did the experiment succeed less happily, because they neglected to take care, as Celsus has taught, "left a weak body, being over- "come by the immersion in cold water, should be carried off by a distension "of the nerves," that is, "by putting him into warm oil, immediately "after coming out of the pond," which some have particularly thought necessary in the winter? although we see that the boy, taken notice of by Mead (t), was soon seiz'd with convulsions, even in the warm water itself. Or was it because they did not observe the other precept of Celsus, "and "throw him into the pond suddenly, and at unawares, without his having "seen it before?" which Etmuller (u) inculcates, and the observation of Ridley seems to intend (x). Or was it because they plung'd them in too late, when they were now "quite overcome with thirst, and with the fear of "water?" although Celsus propos'd even this remedy to these very persons. Or was it because they neglected what Boerhaave (y) thought was previously necessary to be done? which, though they may not be suitable to all, and altogether, yet, I believe, are certainly to most patients, and in some measure. Or, since in the old man, and the young girl, none of these things seem'd greatly to be observ'd, and moreover the former was plung'd into the sea, and the latter into salt water, nor were they ignorant of it, or oppress'd with the disease, nor afterwards dipp'd into warm oil; is it not, I say, more probable perhaps, that as different hydrophobic patients are seen to be differently affected, both living and dead, that therefore the same remedy can not equally be of advantage to all? for which reason, the more pains ought to be taken in preservation against the disorder; though I do not doubt, but even with this view, a different method is to be pursu'd in different patients. And I wish that the sign, which, as I have said before (z), was first remark'd by Salius, offer'd itself in all, and that no matter of doubt could remain in what seems to follow thereon. And it would not be so difficult to guard against the disorder that even now threaten'd, unless the condition of the wounded part was an obstruction thereto, if as soon as ever pains or itching, or, as sometimes happens, a change arises in the flesh that has been cicatriz'd, immediately a little more was cut off from the part than had been formerly bitten, or the same were deeply cauteriz'd; or, at least, that were done which Forestus (a) has related from Gilbert, an Englishman, who treats of this subject: "The first intention is, that the wound may not be clos'd up; or, if

(g) Acutar. Pass. l. 3. c. 16.

(r) C. 3. l. cit. supra, ad n. 22.

(s) Disp. de Rabie, part. 5. partic. 3.

(t) Supra, n. 24. (u) Art. & m. cit.

(x) Aët. Krud. Lips. a. 1705. M. Mart.

(y) Aphor. de cogn. morb. § 1144.

(z) Supra. n. 21.

(a) L. 10. obs. med. 27.

“ it be clos’d up, that it may be immediately open’d, for the putrefaction “ and sanies to flow out, because the poison is wont to lie dormant for a long “ time, &c.” But concerning the preventative cure, I shall again treat somewhat more below (b). However, that it may at present be more evident, as I said a little time ago, that different hydrophobic patients are found differently affected, both in the course of the disease and the dissection; take the third history which I promis’d you, in the following manner.

27. An old man of sixty years of age, robust, and nervous, partly of a choleric, and partly of a sanguineous constitution, had been bitten three months before, in the left wrist, by a mad dog. When the wound was brought to a cicatrix, the old man did not discover the least sign of a hydrophobia, nor even after it was perfectly heal’d, till within twenty days of his death: when, having receiv’d severe threat’nings and grievous stripes, from a certain person, he began, immediately from that time, to be agitated with a surprising, unusual, and unreasonable fear; so that he not only trembl’d at every little noise he heard, but even immediately look’d upon every stranger, whom he met with, to be a betrayer, and if it was possible by any means, would fly to a hiding-place to avoid him. Soon after these symptoms, he was seiz’d with a dread of water and light, and was brought into the hospital, where he liv’d two days. While he was there, he was order’d to drink water, which he attempted to do, though it was slowly, and with such contortions of body that shew’d him to be unwilling, and like one who was constrain’d. And indeed it was with great difficulty and uneasiness that he began to swallow it; but when he had drunk with difficulty the first part of the draught, he got the remainder down without difficulty. No foam was ever observ’d at his mouth: he spat indeed, but his saliva was fluid. However, that incredible fear, and the aversion to water, and the difficulty and uneasiness in the beginning of swallowing, continu’d unto the very time of his death.

His belly being open’d, the intestines seem’d all to be very much distended with air, beside which, they contain’d hardly any thing. In the stomach was a thickish fluid, not in great quantity, nor viscid, but of a cineritious colour. The gall-bladder contain’d but little bile, which was of a high yellow, and had stain’d the duodenum with the same colour, and that part of the liver also, which was nearest to the gall bladder. The iliac veins were so turgid with blood, that they equall’d the natural diameter of a small intestine; but their corresponding arteries were entirely empty.

In the thorax, the lungs, to use the words of Boerhaave (c), were *coarctato omni fere crure incredibiliter pleni*, that is, “ incredibly fill’d with almost “ all the crassamentum of the blood, collected and condens’d together:” and in their back part might even be said to be affected with a gangrene. In the pericardium was a yellowish water, perhaps to about the quantity of three ounces: in the heart was a small quantity of blood, which resembled, in its colour and consistence, black pitch that is half-melted. The vena azygos, or sine pari, contain’d a very small quantity of blood: but in the neck, both the carotid arteries, and the internal jugular veins, were entirely empty. The organs of deglutition were without any mark of inflammation, unless that at the top of the pharynx, some little redness was discover’d;

(b) N. 29.

(c) Aph. cit. § 1140.

but the membrane which invest'd the cartilage, call'd epiglottis, was become crisp and shrivell'd. The vessels of the meninges, both arterial and venous, were immoderately full of blood, and that, as it was in every other part, very black. The optic nerves were thicker, but more lax and flaccid than usual. Nor indeed were the cerebrum, cerebellum, and spinal marrow, more dry than they generally are, nor yet the viscera of the thorax and abdomen, nor any of the muscles. In the ventricles of the brain was a yellowish water, to about the quantity of three ounces. This dissection was perform'd on the twenty-first of May, in the year 1727.

28. Although the fear of death, which was impress'd by threatnings and blows, seems, at the same time, to have excited the latent virus of the hydrophobia, and to have moderated its effects, yet it cannot be deny'd, that this disorder belong'd to the species of hydrophobia, inasmuch as the bite of a mad dog had preceded, and the dread of water had been the consequence of it: unless you would perhaps rather choose with the followers of Andreas, that it should be call'd a Pantaphobia. For they, as it is in Cælius Aurelianus (*d*), asserted, "that those were Pantaphobi whom we may call Omniponi, "for they are said to fear every thing;" which disorder, "if it could really "happen," Cælius would have to be thus distinguish'd, "that it brought "on not only a fear of drink, but of all things." But if we consider the difficulty, such as it was, of swallowing fluids, that was observ'd in the old man treated of; and still more, if we consider the bite of a mad dog, which had preceded, we shall, I think, easily see why there is no reason, on the score of other accidental fears, which were join'd with it, to suppose it a disorder of any different kind from a hydrophobia. For if he had happen'd to have had a dread of some things only, and not of all, beside water, as of light for instance; should we, for that reason, have said, that it was a different disorder? in imitation of those whom Cælius, in like manner, speaks of (*e*), who would have call'd the fear of air, for example, aerophobia, had it not been that "it was generally ascrib'd to phrenitic persons;" for some of these are afraid of the "bright" air, and some of the "obscure."

But common symptoms, and those which are attendant upon various diseases, are to be separated from the proper; although it often happens to hydrophobic patients, that they are afraid of the air. Nor do I say this, because, when the disorder is now coming on them, there is wont to be observ'd in them, as Cælius (*f*) has indeed asserted, "an unusual complaint of "the air, as if stormy, when, at the same time, there was a perfect serenity "of weather." But I say it for this reason, because, when the hydrophobia is already come on, many are afraid of the air when it is agitated. Thus he of whom Zwingerus (*g*) speaks, "had an equal dread of the free air, as of "liquids; and if the windows, or doors, were open'd, his symptoms were "all render'd immediately more vehement." And another of whom you will read in the Sepulchretum (*h*), "took the utmost pains that they should "be kept shut," being extremely terrified with the noise "of a thund'ring "wind," which he seem'd to himself to hear. But a man, whose case was laid before the Royal Society of England, by Prym (*i*), seem'd to himself

(*d*) Acut. Pass. l. 3. c. 12.

(*e*) Ibid.

(*f*) L. cit. c. 11.

(*g*) Vid. obs. cit. supra, ad n. 19.

(*h*) L. l. sect. 8. append. § 2.

(*i*) Saggio delle Traslaz. p. 2. c. 8. n. 4.

to be suffocated, even from the slightest breath of air. And a woman, whose history is written by Platerus (*k*), fell into a danger of suffocation from the same cause; although she had not contracted this disorder from a mad animal; as others also beside her had not, of which many examples are extant; unless you are perhaps ready to suspect with some, that since this virus is not only contracted very easily, by contagion (*l*), but also, when contracted, lies latent a long time; that all these persons became hydrophobic, either from a contagion, that was not at all taken notice of, or that had entirely escap'd their memory. Although, on the other hand, it may also be suspected, by any one, that if not always, at least sometimes, we are ready, without reason, to refer these disorders to the foam that was thrown out from, or a wound that was inflicted by, a creature who was perhaps not mad, when we should rather ascribe them to some poison of the same kind generated within the constitution. But lest this discussion should lead us too far from our intended purposes, we will consider of these suspicions farther, hereafter (*m*).

29. But here to the four examples of hydrophobia being join'd with the fear of air, we will add a fifth, by subjoining the promis'd history of the virgin of Modena (*n*), lest it should perhaps perish with that Italian answer, in which I formerly read it at Bologna, in manuscript (***), and which my friend Ramazzini wrote almost fourscore years ago, against the fourth censure of Jo. Andr. Moniglia, but was forbidden to publish. It was the fiftieth day after this virgin had been bitten by her own lap-dog, in her lip; when she being in extreme good health, and suspecting nothing less than that she should presently be affected with a hydrophobia, while she was by chance passing over a kind of stream, manifestly shew'd herself to labour under that disorder. Among other symptoms with which she was afflicted, was the sense of a very small wind, striking upon her head; for which reason she cried out vehemently, again and again, that the windows and doors might be closely shut up. And at the least motion which happen'd in the bed, she cried out; but if any one shook up the clothes, or offer'd her a fan, then she was exceedingly frighten'd, and was seiz'd with the most violent convulsions. She was also compell'd, by a person who was with her, to drink that water which she so much hated, and that in a large quantity. After which she lost the power of speech, and being tortur'd with the most cruel convulsions, she soon ceas'd to live. At the very time, when she was just giving up the ghost, somebody happening to put a biscuit to her mouth, with one end of it moisten'd in wine, she refus'd it; then being offer'd that part which was dry, she accepted of it, nor refus'd to eat it. This is nearly what I remember to have read in that observation of Ramazzini; from which, and from other things, he also gather'd, that neither an acute fever, nor a delirium, always accompanies a hydrophobia; but that to compel those, who labour under such disorders, to drink, or to plunge them into water, brings on a more speedy destruction: and that it was not without reason they dreaded water, inasmuch as being

(*k*) Obf. l. 1.

(*l*) Vid. supra, n. 21.

(*m*) n. 31.

(*n*) Supra, n. 19.

(*) Nuper interea, cum tota illa Controversia, typis Mutinensibus, ut audio, edita.

feiz'd with a disorder of deglutition, and not of the mind, they certainly, with reason, dread the danger of suffocation. I did not, however, bring this observation merely to confirm what I had before advanc'd, that the dread of agitated air was often join'd with the hydrophobia, but also to confirm other things. For this observation, join'd to that which will presently be produc'd from Forestus, and still more with that which is read in Mathiolus (*o*), of Baldus J. C. will be a confirming proof to you of what I asserted above, to have been seen by me in a boy (*p*), although his face was bitten by a mad dog in that place where the venom can easily communicate with the saliva; yet that not very speedily, as in others, from a bite of the same parts, was the hydrophobia brought on, but after forty days only. It will also, perhaps, make you attend to what Salmarius (*q*) has added, after having admonish'd us, that though the bath has been profitable to most people, when it was us'd by way of precaution after the bite, yet the deaths of many sufficiently demonstrate, that it is not altogether to be depended upon as a remedy. "For "in most persons," says he, "the sight of the water stirs up and excites the "hydrophobia more speedily, by putting the poison which is within the body "in motion, and which otherwise might have lain latent much longer, with- "out any inconvenience to the patient, and perhaps have been subdu'd and "extinguish'd by means of alexipharmacs." Thus I see it happen'd to a monk, who almost two months after a whelp, which he had held in his lap, had bitten his lips and his cheeks, as Forestus (*r*) relates it, was not seiz'd with a dread of water before "he was passing over a ditch, walking on a "plank, and leaning on a staff; for upon seeing the water he was struck with "fear, and was not able to go over without great horror and dread: and "hence was to him the first origin of the hydrophobia." So it happen'd to the virgin of whom I have spoken, the external cause of whose disorder, as also the first manifestation of it, were entirely after the same manner with the last, although the other symptoms were widely different.

Do not, however, imagine, that I esteem the external use of water, whether you would chuse to make use of the bath in a common way, or the sudden and unexpected immersion recommended by Celsus, as a noxious or useless experiment, by way of prevention, so that it be but early and sufficiently apply'd to: although Mead (*s*) affirms, that the bath, join'd however with his remedy, even us'd late in the disease, has nevertheless been of equal advantage, yet concerning the happy success of immersion, which is principally us'd among the Dutch, two of their most eminent physicians, Tulpus (*t*), and Stalpart (*u*), are by no means agreed. For doubtless, as Tulpus and Mead deny, that after so many experiments, they have known of any one, to whom their particular methods of treatment, in the preventative cure, when early and strenuously made use of, were not salutary; it is certainly reasonable to suppose, that at least most of them were in this manner fav'd: and if most of them, it certainly will not be just to suppose, that all

(*o*) Comm. in Dioscor. l. 6. c. 36.

(*p*) N. 22.

(*q*) L. de morfean. rab. c. 3.

(*r*) L. 10. Obs. Med. 27. in ichol.

(*s*) Traët. de Venen. Tentam. 2.

(*t*) Obs. Med. l. 1. c. 20.

(*u*) Obs. rar. cent. 1. in ichol. ad obs. 100.

of them escap'd for this reason only, because they were not at all, or but slightly, infected with the poison. Nor does it escape me at present, what difference there may be betwixt one bite and another, either as it may be more lacerated, or not lacerated at all, (although to the fatal examples of both kinds of wounds, others are at hand, which might be added (x)) or because the dog which bites is not yet evidently mad; or even if he be, so that he has but wip'd away all his saliva, by fixing his teeth upon other persons, or by passing them through thick doublings of garments, or any thing else of that kind: yet I should not easily persuade myself, that in so great a number of persons who have been sav'd, they were all bitten in such a manner as to contract little, or scarcely any at all, of the venom; or that among those almost innumerable persons, who are spoken of by Tulpius or Mead; there was not one who had really receiv'd the poison into the constitution. And I should even think it much more probable, to those who consider what generally happens, to such as have us'd no preservative methods of cure, after the bite; I say, it is doubtless much more probable, that out of the prodigious numbers of those, who, having us'd one method of cure or other, have escap'd the hydrophobia, most of them must have been seiz'd therewith, if they had not averted it by their methods of cure.

But to these varieties also, which have been made mention of in the bite, and not only to the various dispositions of the biting dog, or of the fluid and solid parts in the person bitten, would I willingly attribute those very many circumstances, in which hydrophobic persons differ one from another; so that some are oppress'd sooner, and some later, by the breaking forth of this disorder, and in both classes different persons differently. For there are some who are violently delirious; and some again, even to the very last, retain the power and use of their senses. Some cannot bear light, or white bodies, or the slightest motion of the air; and others, again, none of these things affect. But, not to repeat all those things, which I have already related or quoted above, and much less to add others, there are some who have so great a dread of liquors, of any kind whatever, that even if they do not see them, but only hear them nam'd, they cry out, tremble, are convuls'd, and swoon away. And these things, though they happen in most, yet are so far from happening in all, as they seem to believe, who contend that this dread of water is the pathognomonic sign of the hydrophobia, that hydrophobic patients are not wanting who drink wine; nor such, who not only do not shudder at the mention of water, but being order'd to go into the bath, immediately set out to go thither, even when the disorder is far advanc'd (y); nor finally, such as will drink water itself, without difficulty, when the first trouble of swallowing is overcome (z).

30. And as there are many things, in which these patients while living differ one from the other; so there are not fewer, but even more, in which their bodies differ after death. And this you will immediately comprehend, if you compare, one with another, those eight observations of this kind, which were before publish'd, and which may be read at length, partly in the

(x) Ut Eph. Nat. Cur. cent. 9. obs. 37. & (y) Supra, n. 23.
act. corund. vol. 5. obs. 5.

(z) N. 27.

Sepulchretum, and partly each in its distinct author, as I have have pointed out above (a); and moreover, these three, which I have now added for the first time. For to begin with the external parts, and proceed inwards, you will find, that in three of them, a lividness was found, and that this was remark'd in the fingers, on the shoulder, on the back, or in the neck: once the whole body was vehemently extenuated, as in a hectic person; once the face only: in one the muscles were universally much drier than natural, which is never taken notice of in any other place, and even once expressly denied: and upon opening the belly and thorax, once, what I said just now of the muscles, which has been once taken notice of, and once denied: once the omentum was entirely consum'd, and the mesenteric glands, and the pancreas, extremely extenuated: the stomach once turgid with air, and its vessels distended with blood: its internal coat once corrupted, and the others distinguish'd with red spots: five times, indeed, a moisture was observ'd in it: but once much, three times little, once yellowish, once green, once of a yellow colour degenerating into green, once extremely yellow, once cineritious, twice viscid, once not viscid: the intestines were three times distended with air; once not at all, but ting'd here and there with red spots, distinct from each other: the liver was once yellow and hard; once in a great part of it inflam'd, and near upon a state of gangrene; and once already livid; but its vesicle was once full, twice very full of bile, which was three times either very black, or approaching to it, once somewhat green, once yellow, and then in small quantity. Thus far of the belly.

And in the thorax, the whole remaining part of the internal surface of this cavity was red and livid; but in one body, at the circumference of the diaphragm only. In another, the diaphragm was also not entirely free from inflammation. The lungs in one and in another also were dry, and destitute of moisture; in one with vesicles here and there on the surface; in five they were wholly, or partly, black; in four they were in great part also full of blood: in one the pericardium was, in some part of it, almost friable; in two without any moisture; in one with a very little only; but in another, it had three ounces of yellowish water in it: in two the right auricle of the heart was dilated with air: the heart itself in as many dry; in one flaccid and extenuated; the ventricles in one being entirely destitute of blood, and in one having slender polypous concretions: yet in three they contain'd blood; but in one only little, and like melted pitch; in another concreted, almost without any serum; but in the third, in such a manner, that the right was full of grumous blood, while the left contain'd it altogether fluid.

As to the neck and fauces, the œsophagus of one was narrow in those parts, as well as in the chest, and in a manner constring'd: in one it was internally inflam'd: and the pharynx in three, and the aspera arteria in as many, were seiz'd with an inflammation, either slight or great, or already verging to a gangrene: in one, however, the œsophagus was free from disease: the fauces of some were without any traces of inflammation, and the membrane of the epiglottis was in one become crisp'd: the larynx of one was of a red colour, degenerating into livid, in which also the tongue was found thicken'd, and the pharynx entirely full of a foam which was yellow, but degenerating into green.

Moreover, the cerebrum and cerebellum of one inclin'd to dryness, and in one, together with the beginning of the spinal marrow, were much drier than in general; but in one, none of these was any thing drier than usual, and indeed the optic nerves were pretty lax: finally, in one or two of them, the cerebrum had nothing worthy of remark. And again, in the stomachs of two was extravasated water; but in one of them, in small quantity, and yellowish; in the other, in small quantity also, but reddish: and in yet another, there was no appearance of it at all. In one were bubbles of air, under the dura mater; and in the sinusses of the same membrane were lax polypous concretions. In three, all the vessels of the brain were extremely distended with blood.

And as to what relates to the blood in general, the arteries of one were very full of blood, and the veins almost empty: in another, the vena sine pari was almost empty, but the iliacs greatly distended therewith, and their corresponding arteries empty: and equally empty in the neck were both the internal jugular veins, and the carotid arteries, as the vessels within the cranium, both arteries, and veins, were equally full; which was observ'd in two others also, as I just now pointed out. In one, in like manner, was none of the blood concreted in any part, but the whole of it was very fluid, and did not coagulate in the external air, though cold. But in another, it was rather concreted than dissolv'd; in another, not polypous, yet not dissolv'd. Moreover, the great vessels of the heart, in one of them, had the blood entirely concreted; and how it was found in the heart, I have said above. Last of all, in two or three of them, it was remark'd to be black. And that we may omit nothing out of all those things, which come under a general view, it was remark'd, that two of the carcasses smell'd very ill; but that the least so, which, according to appearances, ought to have been the worst.

31. Nor, indeed, have I found less variety in other dissections of hydrophobic patients, which were observ'd or publish'd by learned men, before I revis'd these papers; for instance, by Richard Mead (*b*), whom I have spoken of already, Janus Plancus (*c*), Laurence Cajetano Fabbri (*d*), Dominico Brogiani (*e*), and some others besides (*f*), whose books have not come to my hands. And in order to compare these observations with those just now produc'd, preserving the same method of proceeding, I must begin with one of the celebrated Phil. Eberh. Dillenius (*g*), who being forbidden to dissect the body, observ'd here and there external lividnesses, and as it were blacknesses, from contusions, but especially about the breast. Among the rest, there is one who takes notice of the muscles of the belly being once inflam'd, and one of the muscles being universally tumid and robust. There is one, who, having examin'd thirteen bodies, writes, that there was for the most part, scarcely any fat, and that even the omentum was in a manner wasted; but

(*b*) Traët. de Venen. Tentam. 2.

(*c*) Apud Simon. Cosmopolit. Epist. Apolog. pro Plancio, & alibi.

(*d*) Dissert. 3. intorno ad alcune malattie, n. 62.

(*e*) Traët. de Venen. Animal. p. 2.

(*f*) Apud Swieten. in Comm. in Boerh. Aphor. §. 1140.

(*g*) Eph. N. C. cent. 7. obs. 54.

among the more common appearances, were considerable inflammation in the primæ viæ, laceration, and gangrene. Another says, that in one, all the viscera of the abdomen were slightly, and in another considerably, inflam'd.

But particularly in some, the cavity of the stomach was foul with foetid and black bile; and sometimes mark'd here and there with bloody points as it were. In one, all the intestines, with the mesentery, were slightly inflam'd; in another, a little tumid and inflam'd; and in some the ileum in particular. The liver was, not uncommonly, tense, turgid, and brownish; and the gall-bladder in some almost empty, and in others distended with a glutinous, and black bile. In three, the bladder of urine, and at the same time the penis, had been seiz'd with a slight inflammation; and by observations of this kind you perceive, that we may suspect cantharides to have been made use of; a remedy, in other respects, not only recommended formerly against this disease by the Arabians, or believ'd to be the latent basis of certain powders, made use of as arcana against the same disease, by Scaramuccius (*b*), and others, but expressly, and openly, as far as I see, commended in this our age, not by one nation only; and even by the Hungarians (*i*), esteem'd as "an infallible specific," in the cure of even the most violent hydrophobia: although, among our countrymen, scarcely any one will readily exhibit them, by way of precaution, to whom so many various other remedies, which have been highly celebrated for the same effect, are less unknown, and those, in fact, such as are not so very acrid, and yet promote urine equally.

But, to pass on to the thorax: the septum transversum was in some found to be inflam'd; and there were very frequent marks of inflam'd lungs; and here and there slight adhesions of the viscera, as also in the abdomen; the pericardium was in some without moisture; the left ventricle of the heart was in one altogether empty, whereas the right contain'd very black blood; but in another, both of them were full of florid and fluid blood, in the same manner as the pulmonary artery and the vena cava were.

But of those parts which are betwixt the thorax and brain, the larynx indeed was the most seldom and the least inflam'd; yet in one, all its muscles, and those of the os hyoides and tongue were inflam'd, and sometimes the papillæ of the tongue were swell'd, and in one were a few little tubercles at its root, some of which appear'd suppurated. As to the pharynx, though it had frequently no inflammation, yet in general, a considerable one was seen therein, especially towards the tongue. And if you compare this, and these appearances, that have been found in the lungs, intestines, and stomach, as I have already said, with those which the celebrated Kochlerus (*k*) observ'd in the same parts, when he open'd the body of a man of high station, who without any previous bite of a mad animal was taken off by a hydrophobia, you will be surpris'd to see how far they agree one with another. A hydrophobia of the same kind (*l*), and from the same external cause, to wit, from drinking very cold liquors when extremely hot, he had also observ'd in a soldier; but was so taken up with other employments, that he could not

(*b*) In append. cit. supra, ad n. 21.

(*i*) Commerc. Litt. a. 1735, hebd. 11. n. 3.

(*k*) Commerc. Litt. a. 1743, hebd. 5. n. 2.

(*l*) In eod. Commerc. a. 1740, hebd. 36. n. 1.

dissect the body. The celebrated Genselius (*m*), however, saw a hydrophobia which had its origin from the same cause, and found the muscles of the pharynx, indeed, and glands, pretty red, but the whole stomach was in a manner dried up; yet the rest of the viscera, and among these the lungs, were in their natural state. This hydrophobic patient, although he trembl'd at the sight of light, and white linen, and could not endure to look upon some kinds of fluids; yet he was not, like the two former, vehemently tortur'd at the bare mention of them, or when offer'd at the greatest distance, did not faint away. Which things I mention for this reason, that they who place the pathognomonic sign of the hydrophobia in these things, and are unwilling to suppose, that they can never exist without the bite of a mad animal, may, by adding these two histories to so many others which are extant elsewhere, and especially in the observations of Schenck (*n*), acknowledge, that the true hydrophobia can even be brought on without contagion; although, out of the antient observations, those only which Marcellus Donatus (*o*) has transmitted to posterity, ought to be sufficient to make them acknowledge it. For who can believe, that out of five patients, which one and the same physician saw, within a few years, seiz'd with a hydrophobia of that kind, there was nobody who would have observ'd, or remember'd, that they had been infected by a mad animal; but that all the patients, and all their domestics and friends, were equally stupid, and equally forgetful; so that not the least suspicion of any taint, which might have been contracted, should remain.

But let us return to the remaining heads of the comparison we undertook. There were some in whom the dura mater, and even both the meninges, were found more or less inflam'd, the vessels being turgid with black blood, and not without some little suppuration towards the vertex, in one of the bodies; and even in a mad dog, not without ulcers. The cerebrum itself was sometimes inflam'd, or its cortical part, but this slightly, and more of a brown colour, or its medulla sprinkled over with bloody points. But the ventricles in one, and another, appear'd by no means moist. The spinal marrow was much drier than usual.

But even the whole body in one was dry, and inflam'd; and in another, of a violet colour, from inflammation on the whole surface. Moreover, by one author was remark'd a particular dryness and tension of all the solid parts, among the more frequent appearances, and especially of almost all the membranous parts. But in regard to the blood, with which some write that the arteries were very full, and that very fluid, so as scarcely to coagulate in the open air; there are not wanting those who teach, that the arteries in one subject were indeed full, but that the vena cava was full also; and in another, that all the blood was contain'd in the veins, and was destitute of serum. And there is even one, who affirms, that in thirteen carcasses, the veins were always seen to be fill'd with blood, which was as fluid as it generally is; but that the arteries were empty. And he who denies, that in four bodies he saw any of those things, which Boerhaave laid down as general appearances, from the dissections of others (*p*), must of consequence agree with that last

(*m*) Eph. N. C. cent. 3. obs. 50.

(*o*) De Med. Hist. Mirabili, l. 6. c. 1.

(*n*) Obs. Med. l. 7. ubi de Venen. ex Quadrup. obs. 17.

(*p*) Aphor. de cognof. morb. § 1140.

observer in this, but in other things he must necessarily differ; as for instance, in the dryness of the solid parts. Finally, I have read, that the body of a woman, who died of a hydrophobia, was entirely putrid within fifteen hours after death, and that in the middle of winter.

32. Since, therefore, the whole summary of these matters, which can be collected from all the observations compar'd, that have ever come to my knowledge, amounts nearly to this, you very well understand, that the dead differ much more, from one another, than the living. For while they live, they certainly all agree in this, that they cannot drink water without difficulty, and most of them even not without great horror and detriment. But in what peculiar circumstance the carcases of them all agree, I do not see. For as to its being said, both now and formerly, that an evident dryness was found in them, it is certainly not found in all, nor is perhaps greatly to be attended to in those where it is found; since it is frequently to be rather imputed to the remedies, or charg'd to the account of some other causes, which have brought on great evacuations, either such as fall under the notice of the senses, or rather such, for the most part, as escape them: in which class are a great number of alexipharmacs, and frequently acute fevers, and often continual clamours, and violent agitations of the body, especially as the patient drinks nothing, or at least very little. And therefore you might have seen, that in the old man (*q*), who drank, and was not agitated with a maniacal fury, but was rather under the government of a melancholic fear, there was so far from being a dryness, that the pericardium, and the ventricles of the brain, contain'd a pretty large quantity of water.

Nor, indeed, is any one of the appearances, which I have observ'd to be found in dissecting of these bodies, more common to all hydrophobic patients than this dryness. For they are so different in different bodies, that if you consider them separately, you will believe, that not only every particular opinion of the ancients, which Cælius (*r*) has related, concerning the seat and nature of this disease, was really true, but that most of the others are true also, which have been since publish'd: yet, if you consider them all in general, you will perceive that none is certain, but that one is more probable than the rest. "That the part suffers first on which the wound was "inflicted," and that from thence the disorder proceeds to other parts, nobody, as Cælius says, denies; and from the time that Salius (*s*) pointed out that sometimes evident sign of its progress, which has been long delay'd, it is not to be denied, that the disorder does proceed from the wounded part, at least in some measure. But from the progression of the pain upwards, and from what Salius observ'd it to terminate in, a certain confusion, unsteadiness, and weakness of the mind, that virus does not seem to be carried through the veins, but by the nerves, up to their origins: and in these parts, or in the motions that are made in them, some certain but inexplicable change being brought about, which, according to the different dispositions in different persons, is greater or smaller, more or less diffuse, nothing can now happen to hydrophobic patients, which we may not particularly deduce from thence. Some (as in natural antipathies different persons are averse to

(*q*) *Supra*, n. 27.(*r*) *Acut. Morb.* l. 3. c. 14.(*s*) *Supra*, n. 31.

different

different things, though we see the antipathies stronger in one than in another) will have so great an aversion to water, that they begin suddenly to shudder, not only at the sight, but even at the name thereof; and others will not deny the possibility of their drinking it, till they have made the trial, and found a difficulty in swallowing it. Some will be delirious, and in others perfectly sensible. These will be seiz'd with great inflammations, and those with none. But though they vary one from another in these and in other things, yet the external or internal convulsion will doubtless exist in all; and to the variety of this in particular, and its disposition, that very great variety in the living patients, and in their bodies after death, must be owing. And you perceive, that the conjecture of those seems very probable to me, who thought with Democritus, and Gaius, a follower of Herophilus^(t), that "the nerves" and "brain" were the principal seats of this disease; to which opinion, you know, the chief physicians of our age are not averse. And with a reference to this opinion, a very grave man related to me an anecdote, when I was applying myself to the study of physic at Bologna, concerning Alberto Fabbri, who was certainly the first of physicians in that very learned city, a little before my time. For this gentleman, being seiz'd by one hand, and strongly held, by a patient labouring under a hydrophobia, while he was feeling his pulse with the other, fell immediately into so great a dejection of mind, that having scarcely any command over his reason, the intention of killing himself frequently enter'd into his thoughts. When he had already, for seven days, avoided company on that account, it happen'd, that being fix'd, and rivetted, as it were, to his perpetual sadness, he was wetted quite through with a very great shower, before he even perceiv'd that it was at hand. The place he was then in was quite solitary, and very remote from any houses, so that he could not get to any shelter, till he was, in a manner, thoroughly bath'd all over; and by the time he had reach'd a covering, his melancholy was all entirely wash'd away. What he thought himself of the matter, I do not know; but many believ'd that this was the beginning of a hydrophobia, with which the brain was first attack'd. Yet it is more probable, that this learned physician, calling to mind, perhaps, what he had read in Dioscorides^(u), had not been a little afraid, lest the same thing should happen to him, which happen'd to Themison, when he had a friend of his, a hydrophobic patient, under his care; especially if those things came into his head, which many writers have deliver'd down, concerning this disease being contracted, even without a bite; and he held them all as truths, which many are apt to do, to their own danger, and at their own expence (for we see, that Stalpart^(x), who believ'd nothing at all of all this, when he had felt the pulses of those who suspected they should afterwards prove to have a hydrophobia, always wash'd his hands): I say, it is more probable, that being seiz'd with vehement fear on this account, he fell into a kind of melancholic delirium, which the sudden persusion of water, as it was very recent, remov'd; and the more easily, if the remembrance of that kind of remedy against the hydrophobia assisted the imagination, which had given rise to the disease, to take it off. But explain this as you please.

(t) Apud Cælium ibidem. (u) De Med. Mat. l. 6. c. 36. (x) Schol. cit. supra, ad n. 29.

As to what I said, however, of the convulsion, which was no doubt to be suppos'd in all hydrophobic patients, even the mere difficulty of swallowing water seems sufficiently to prove it. For whether there is no inflammation of the fauces or gula, you have already seen above (y), that in order to explain this difficulty, Cæsalpinus formerly, and Aromatarius, have suppos'd a convulsion of these parts, Ridley (z), and others among the modern writers, following them. Or whether those parts are inflam'd, you may see that the celebrated Van Swieten (a) deduces this inflammation from a frequent convulsion, as an effect from a cause; and from thence even draws a very probable reason, why a boy, who was very soon taken off by a hydrophobia, should be free from that inflammation; and that a young man, who lay longer in the agonies of it before he died, should not be free therefrom. So in regard to the other parts, in like manner, and the viscera, why they are found, in some hydrophobic patients, to be very much inflam'd, and in others, not at all, you may deduce also from the more or less frequent, or violent, convulsion of these nerves, which go to those parts. And even that "too great tension and dryness of the nervous membranes," from which Mead (b) very learnedly drew this conclusion, "that they feel more acutely than naturally" in hydrophobic patients, and thus "the accusom'd impressions of objects create no longer a grateful sensation, but give uneasiness and pain:" I say, that tension, if it is not from a total dryness, as it seems not to be in the first days of the disease, you may also account for from the convulsions; which effect thereof was, in fact, found by the very ingenious Brogiani (c) to remain after death, in most bodies at least, if not all. I pass by other arguments, which are brought by many, to prove that the hydrophobia is a convulsive disease. If, therefore, in this disease, so much is to be attributed to convulsions, nor the cause of them, inasmuch as it is invisible in the brain, nor the change induc'd upon the nerves, but their effects only, and those different, according to their different stages, and in proportion to the varied violence of them, fall under the notice of our senses, in the dead body; you very well understand, that in order to confirm or disprove those things which we have already said, or now say, too few dissections have hitherto been made. For there are but few in so great a number, which a history sufficiently accurate precedes; not only of the age and constitution of the man, but of the manner and time in which the virus was communicated, and whence it was contracted; as also for what time it lasted, and with what greater or less fierceness, and continuance, of all the symptoms, and on what day of the disease each of them began: then, after that, we ought to have a history of all the appearances, as far as is possible, which are found to be præternatural, in all the parts, and in every distinct part, of the same body; lest, if any thing of the smallest importance should by chance be omitted, it may be suppos'd, that some other appearances were not so much wanting in the body, as not diligently sought after.

33. I would not have you, however, readily imagine, that among these præternatural appearances, worms have ever been found to abound in the

(y) N. 19, & 20.

(z) Vid. Aët. Lipf. cit. supra, ad n. 26.

(a) Comm. in Boerh. Aphor. § 1140.

(b) Tentam. cit. supra, ad n. 31.

(c) P. 2. ibid. cit.

brain; notwithstanding you read in the Sepulchretum, that they have been seen in the brain of a mad dog (*d*); and notwithstanding what Aromatarius (*e*) has written, "that it had been observ'd a worm was sometimes generated in " the anterior part of the head, both in a mad dog, and a hydrophobic " man." For I believe this must be understood of the cavity of the nose, or the recesses of some sinus which communicate therewith, and not of the cavity of the cranium, as I have already shown (*f*). Nor do I understand, in any different manner, those things which are produc'd a little before in the Sepulchretum (*g*), from the epistles, not from " the observations " of Bartholin, of worms which men of rustical employments are said to have observ'd " to be in the heads of horses, sheep, and oxen," but in the " phrenitis and vertigo;" and not in that disorder which is there treated of, the " Rabies;" under which one word, how many various disorders are intended, the justly commended Aromatarius (*h*) has shown. By turning to these things, you will also meet with those, which are added in the Scholium, to the observation that I now point out, in the first place, in the Sepulchretum (*i*). That observation speaks of worms as really existing in the brain of a mad dog, or rather as observ'd, " in pretty large bubbles, elevated on the " viscous and putrid liquor of the brain, or from an internal motion." But whether the cranium was sufficiently examin'd, that no passage was open'd, through which worms might perhaps enter, and this in consequence of another disease; or whether it was sufficiently enquir'd, if they were really worms or not; or whether they had not been before in the grass, upon which the brain was spread far and wide, by falling down thereupon, the observation of itself will sufficiently shew. And I confess I fear that if " Reyfius," as the author wish'd, had been present, he would not very easily have expung'd what he had written (*k*), " that the report," spoken of by Jacobus de Partibus, " as if the canine rabies had proceeded from a worm, generated in the brain of a dog, was a mere figment confirm'd by nobody that " he knew of." Do not, however, imagine, that if this same observation had been more accurately made, I should nevertheless still withhold my assent, as if I thought it could by no means ever happen, that worms should excite the rabies, of which we treat, in a dog; since Zwingerus (*l*) relates the story of a dog, who was so mad, that a boy whom he had bitten, perisht'd before the fortieth day; and yet this dog was entirely cur'd of his madness, after his master had open'd a slight tumour in his foot, which he was continually biting, and from the pain of which he was continually running about, driven as it were to anger and madness, and drew out a living, white, and thickish worm. That the dog was really mad Zwingerus knew, who was physician to the boy in the hydrophobia. That the dog also was cur'd in such a manner, as he was a neighbour to the dog's master, he could not but know. Yet I had rather that he himself had examin'd this worm, in order more certainly to know, that a true worm, and not any thing in the shape of a worm only, had come out from the tumour.

(*d*) L. 1. S. 8. in Addit. obs. 3.

(*e*) Disp. de Rabie P. 4. part. 7.

(*f*) Epist. 1. n. 8, & 9.

(*g*) S. cit. 8. obs. 11.

(*h*) Disp. cit. p. 1. partic. 2.

(*i*) Obs. 3. cit.

(*k*) Elyf. jucund. Quæst. Camp. qu. 61. n. 1.

(*l*) Eph. N. C. dec. 3. a. 2. obs. 105.

34. For we often readily believe things to be worms, which are not so. "It is vulgarly asserted of a mad dog," says Etmuller (*m*), "that under his tongue lies hid a certain oblong worm, which some even affirm to have been seen by themselves; and that this being early taken away, no dog becomes mad; but if it be not taken away, and encrease, madness is necessarily the consequence; whence some persons are wont, by way of precaution, to extract this worm; and some indeed think, that it is not a real worm, but look upon it to be a particle of grumous blood, collected, and stagnating in the ranine veins under the tongue. But I leave this subject undetermin'd myself, as not yet sufficiently examin'd into." A man of such prudence I commend: and if others would make him their example, we should have fewer fables than at present. And I doubt not but this opinion has arisen from what Pliny (*n*) had written on the subject: his words are, "There is a worm in the tongues of dogs, which is call'd, by the Greeks, Lytta; and this being taken out, when they are young whelps, they neither become mad, nor feel any sickness or loathing." For Aromatarius (*o*) thinks, to omit others at present, that Sextus the philosopher, had, in some measure, assented to, or copied from, Pliny, who, he says, has testified "in the ninth chapter, *De Medicina Animalium*, that worms are found under the tongues of mad dogs." But this I dare not undertake to assert of Demetrius of Constantinople (*p*), if he has said, not that he found a worm in the inferior part of the tongue, but "the effigy of a worm, and the likeness of a white nerve:" nor of Fracastorius (*q*), though for quite a different reason; for he really supposes "an injurious and destructive worm," but as far as I understand, not under the tongue: and there, I imagine, he speaks as a poet; for where (*r*) he recounts the signs of dogs being mad, he does not say a single word of worms in the tongue, or about the tongue. Yet I would not deny, that real worms may sometimes be found there; but that there is a worm, which, as Pliny seems to take for granted, exists naturally in all dogs, and which is frequently taken out from their tongues, I expressly deny. And this Codronchius (*s*), more than others, formerly denied. "You must know," says he, "that the part which is taken out is not a worm, but a nerve of the figure of a round worm." And in the same year 1609, in which Codronchius wrote this, the Pentæsthesion of our countryman Casseri was publish'd; in which (*t*), having delineated the inferior surface of a dog's tongue, he shows a vermiform little body therein, which he also delineates by itself, with its posterior extremity drawn out in a straight line, into a very long tail, that by degrees contracts itself into an incredible smallness. And he says, that it is "a muscle with which" dogs "lick or lap," or "made to lick or lap, and that it is hidden in the middle of the apex of the tongue:" he also boasts himself the "inventor," inasmuch as it was "unknown to others" to that time.

(*m*) Art. & m. cit. supra ad n. 19.

(*n*) Natur. hist. l. 29. c. 5.

(*o*) Disp. de Rabie p. 2. partic. 5.

(*p*) l. de Cura, & Medic. Canum, Gillio

(*q*) in Alcon. extremo.

(*r*) De Contag. &c. l. 2. c. 10.

(*s*) De Rabie l. 2. c. 10.

(*t*) l. 2. Tab. 5. Fig. 4 & 5.

Interpr.

35. But Cafferì had not attended to that passage of Pliny, as his passage, and that of Condronchius had also escap'd me, when I formerly observ'd the same corpufcle in the tongues of dogs, and afterwards took often into enquiry; and I do not know whether any other anatomifts, within these hundred and fifty years, have describ'd or delineated it. But I shall not make a longer difquisition, for this reason chiefly; but rather left any learned man should be fo far impos'd upon, as to take it for a worm any longer; which I suspect has even happen'd in this very age. I believe it is still taken out by the common people from some dogs in this country; for whereas I sought for it in fifteen, of every kind, magnitude, and age; I found it only in fourteen: the only one which was entirely without it, was one of those dogs that butchers use, and the largest of them all, so that he ought to have had one much larger than the others; but if I had at that time thought of the words of Pliny, I would have look'd diligently after the traces of the cicatrix; which, however, could be by no means very evident; otherwise it must of itself have occur'd to the eye. And in another dog likewise, who was very large, I remember, that this part was much smaller, than in proportion to the body; nevertheless it was not so, in other dogs equally large. I even found it in one great dog three inches long; whereas, in moderately-siz'd dogs, it rarely exceeds two, and is generally about that length. In like manner, in another rather of a large size, than small, as the tongue was eight inches in length; this body was three inches, or even more, without the slenderest part of its tail. For as this round body resembles nothing more, if you consider the shape only, than a spindle, so it is extenuated on both sides in such a manner, that the anterior extremity, which is often extended to the very border of the tongue's apex, and sometimes only within a little of it, is less sharp and long; the posterior extremity not only contracts itself by degrees, more and more, but when a pretty considerable space is pass'd over thereby, it dwindles suddenly into a kind of tendinous thread, very thin, and white; which often equalling the length of the body from whence it proceeded, seldom being less than that, and often more, and once found by me at least twice, or more, if not three times, as long, it goes through that middle interstice of the muscles, which are prominent on one side and the other of the lower surface of the tongue, till it comes to the back part, seating itself deeply amongst them. And in the same interstice, produc'd forwards, both the posterior extremity, and the remaining part of the body also, is plac'd; but this latter part so much the more externally, that by its protuberance it touches the very membrane of the tongue, and is seen through it. So that when this membrane is slightly cut into, and together with those two muscles is sufficiently drawn aside, then, indeed, this body appears like a kind of worm; for whiteness and smoothness are added to its figure, to make the resemblance more complete. And if you separate it from the tongue, by means of the knife or fingers, which is very easily done, you see it also smooth on the side which lay hid, but a little reddish. Therefore, that part of this body, which is the thickest, consists of two substances, very closely connected with one another, the one white, and the other reddish; which latter you would readily believe to be fleshy, as that other also, which goes on even to the extremities, you would suppose to be tendinous. But the reddish substance is not made-

up of manifest fibres, and the white is harder than a tendinous substance; so that it seems to be of a middle nature betwixt ligament and tendon. And indeed, as I rubb'd it betwixt my fingers, it seem'd to me, more than once, to approach almost to the nature of a cartilage; and frequently, not to have a continu'd surface, but divided, as it were, into fragments, and those unequally distributed. As often as ever I cut the middle of this body transversely through, that section, in fact, generally resembl'd the area of a circle; but the white substance almost always occupy'd the greater segment of that area, and very rarely the reddish. Nor is the diameter of the whole area any-where great, but even where it is the most distant from the extreme parts, very small. Nor has the anterior extremity a fissure, nor any thing else, which resembles a mouth; nor the body of it any thing within, that is soft or hollow. And although the fibres of the neighb'ring muscles adhere to this body, yet they do not go into it, nor are continu'd thereto; but it is divided from these muscles; by a thin interposing membrane; so that it may, on this account, be, as I said, easily disengag'd, and the surface of it be every-where preserv'd smooth and even. And if this succeeds in the dead body, how much more easily may we suppose it will succeed in the living body? And since matters are thus situated, as it is easy to understand, that this little body, although it is not a worm, is that which has been taken away from the tongues of dogs, and suppos'd to be a worm; so it is equally well understood, that it is neither a nerve, as it seem'd to Condronchius and others, nor a part of any neighb'ring muscle. But whether it be itself a muscle, which Casleri believ'd, given to lick or lap with, or rather a peculiar body, compos'd of a manifold kind of substance, with which the tongue of a dog, that is slender, in proportion to its length, is made firm, and assisted in its motions, I leave undecided for the present; especially as I am hitherto ignorant, whether it is in like manner given to other certain animals, and what difference there is in the tongue's motions, betwixt those dogs from whom it is taken out, and others.

36. But although in the conclusion of this section (*u*), which treats of the mania, and rabies, two observations are added in the Sepulchretum, *De furore uterino*, and after the next section, intitled, *De melancholia*, of which we have treated at the same time, another section, *De imaginatione, ratiocinatione, & memoria depravatis, & abolitis*; do not you, however, expect, that I shall add any other things to this very long letter. For it has happen'd neither to Vallalva, nor to me, that we ever should dissect the body of any one consum'd by a furor uterinus, and find any thing else, perhaps, of inward disorder, besides a surprising bigness of the ovarium, which I have seen in many, not labouring under the furor; whereas, in the observations of the Imperial Academy, besides that, which is almost always (*x*), and the enlarg'd state of the clitoris (*y*), which is sometimes, found, we read, at other times, of different appearances, and among these of the inflammation of the uterus (*z*).

Turning over these observations, as examples occur'd (*a*), of some young women, who putting themselves to death, renew'd the fatal memory of the

(*u*) 8. l. 1.

(*x*) Cent. 4. obs. 142. & Cent. 8. obs. 3. & Act. Tom. 7. obs. 33.

(*y*) Ibid.

(*z*) Ibid. & Dec. 3. A. 5. obs. 124.

(*a*) cit. 3. obs. Cent. 8.

Milesian virgins, and the women of Lyons (*b*); so others offer'd themselves, from which the cause of that feminine madness may seem capable of being compar'd with the cause of a certain pestilence, as it were. For in the small compass of one county only (*c*), in the summer of the year 1698, so many women labour'd at the same time under this distemper, that one physician only, had eighteen of these patients, whom he visited; which circumstance shew'd it to be an epidemic disease: and in the same house, often two, three, or more women, were found seiz'd with the same disease; which, together with other things, proved it to be contagious.

But concerning the disorders of those intellectual faculties, mention'd a little above, I have collected whatever I could, into this very letter, and others (*d*); which I am not dispos'd to repeat, as you will see is done in the Sepulchretum: where, out of twenty observations, relating to those faculties we mention'd, which the tenth section sets forth, you will first see it is expressly said, that thirteen of them had been more largely describ'd in other sections; and then if you consider a little more diligently, you will easily find, that in this very tenth section, some are set down once and again. So the tenth observation seems to be the same as the third, and the thirteenth entirely the same as the seventh; the fifteenth as the first; the seventeenth as the eighth; which the forty-fourth observation of the first section of the fourth book will demonstrate, and the sixteenth observation of the sixteenth section of the first book, and the fifth observation of the fourth section of the same book: not to enquire into others now, nor to say that the ninth, which is sufficiently acknowledg'd in the scholium, has no reference at all to the matter. But thus far at present. Farewel.

LETTER the NINTH.

Which treats of the Epilepsy.

1. **T**HE vertigo, which is treated of in the Sepulchretum, in the next and eleventh section, frequently degenerates into an apoplexy, or other soporose disorders; and many thus affected, at length, die vertiginous. And as this is shewn by the observations produc'd in that section, and especially by the first and eleventh; so also it is confirm'd by others given in the former letters (*a*). And the case being thus, I think it is better, that without any repetition of these things here, we go on immediately to the twelfth section, which treats of a disorder into which the vertigo often degenerates, that is, the epilepsy. For vertigoes, as Galen has rightly taught

(*b*) Apud Schenckium. Obs. Med. I. 1. ubi de mania, & ex ea, mortuis, obs. 1.

(*d*) Epist. I. n. 10. & II. n. 13.

(*c*) Decur. 3. Nat. Cur. a. 7. in append. n. 2, 6. ad n. 8.

(*a*) II. n. 92. III. n. 16. IV. n. 11. VI.

us (*δ*), “ approach very near, in their nature, to the falling sickness, and “ that which they call apoplexy, so as to precede both the one and the “ other.” Of an epilepsy, which was of itself mortal, as it seems to me, Valsalva has left but one observation only, and that very short, which runs after this manner.

2. An old man of sixty years of age, being subject to epileptic fits, was seiz'd with a fever. This was suddenly follow'd by an epilepsy, of which he died. Between the dura and pia mater, besides a quantity of serum everywhere effus'd, a portion of extravasated blood was also found on the side: the ventricles were also fill'd with serum, and in them the plexus choroides had their turgid glandules.

3. If you impute that portion of extravasated blood, as it most probably ought to be, to the last epileptic convulsions, which, as the fever had constrain'd the swelling vessels, might easily bring about some rupture of them, where they were more lax, and this, as it is easy to believe, apoplexy and death were immediately the consequence of; yet the serum will still remain, to which you may perhaps attribute the epileptic paroxysms, or at least this last of them. For you have, even in the very section we are speaking of, and in its additamenta, histories of epileptic patients, not unlike this, where serum was found to be redundant within the cranium: the most antient of which is that sixteenth of Hippocrates, transferr'd from sheep, and “ especially from goats, who are very frequently seiz'd with this disorder,” to men. And notwithstanding these histories are in great number, (although, by turning over the page, you will perceive, that the fifth is the same as that which is produc'd under number ten) yet I think it will not be ungrateful to you, if I add others, one of which was made in the last age, and the others in this. The former is one of Michael Gavaffetti, a physician, indeed, but not professor, at Padua, as some writers call him. “ I remember,” says he (*c*), “ that I “ saw the illustrious cardinal Commendon suffer sixty epileptic paroxysms, in “ the space of twenty-four hours, under which nature being debilitated and “ oppress'd, he at length sank, and died. His skull being immediately taken “ off, I found that his brain was affected with a disorder of the hydrocephalous kind.” And of three, which the learned Balthaf. Walthieri sent to me from Venice, on the last day of March, of the year 1727, I will mention two in particular, which come nearer to the nature of that related by Valsalva. For the histories are of two old women, even of a greater age than the man of whom Valsalva gives the account; one of whom had been long subject to an epilepsy, and the other, having labour'd under an anasarca, was seiz'd with three violent epileptic paroxysms on the same day that she died. Both of them, indeed, had water betwixt the brain and pia mater, and in like manner in the ventricles. Both also had many vesicles, in the plexus choroides, tumid with water; but the first had all these circumstances in a much greater degree than the last. For though the lateral ventricles of the last were almost full of serum, yet in the first, every part was so distended with the same kind of serum, as to be almost ready to burst; and therefore, upon the slightest touch, they poured forth a great quantity thereof. Yet

(*δ*) In Aphor. Comment. 3. 17.

(*c*) De Indic. Curat. c. 39.

water is often found in far less quantity in the cranium of epileptic patients, even in the cranium of infants themselves, in whom that it is found in great quantity at other times, the same section of the *Sepulchretum* teaches (*d*). In the seventh observation, for instance, in a girl of a year old, you see that it was found to the quantity of five pints; whereas in a boy, who was a little older, it was scarcely to the quantity of two ounces; as that diligent observer, and at the same time celebrated physician, Hyppolito Francesco Albertini related to me, in the following manner, when I resided at Bologna, for the sake of prosecuting my studies.

4. A boy seventeen months old, the first-born of noble parents, having been conceiv'd during an uneasy state of mind of the mother, and his father having but weak nerves, had a head bigger than natural, and for that reason heavier, his eyes being heavy and sad, one part of his thorax depress'd, his legs not sufficiently firm, and his flesh flaccid. This child having been before, when he had scarce arriv'd at a full year, taken with disorders, that made it necessary to lose two ounces of blood, and presently after being freed from those difficulties, having suffer'd somewhat of an epileptic disorder from dentition, last of all, when one of the dentes canini began to come forth in the upper jaw, shew'd, that the aphorism of Hippocrates is true (*e*), which asserts, "that fevers and convulsions are most threatening to children when the dentes canini are cutting through the gums." For being first seiz'd with a fever, then with a sudden and very violent epilepsy, he was found by the physicians who were call'd to him, already to have a stertor, and to lie without the least signs of a pulse. In this extremity, the physicians order'd the neck, temples, and nostrils, to be rubb'd well with oleum succini, and applied to his nose, not the spirit of salt ammoniac by itself, but only a slight odour of it, and pigeons open'd alive to his feet: by which means the disorder remitting a little, and the arteries beating again, they did not hesitate to take blood away from his arm, to the quantity of three ounces. From which respiration, indeed, became less difficult; and the boy returning, as it were, to himself, lifted up his little arm, and rubb'd his forehead. But nevertheless, as his head, which was oppress'd by the force of the disease, was not at all reliev'd, and as even when the fingers of the physicians, for the sake of the experiment, were mov'd close to his eyes, they nevertheless continu'd open, and discern'd nothing, it was concluded that the child could not be sav'd; who accordingly died at the sixth hour from the beginning of the fit.

The cranium being open'd by the very learned physician Peter Molinelli, not more water appear'd than I said before, and that a little bloody, as well in the cerebrum, which was very soft, as every-where about it, but especially at its basis, perhaps in consequence of the dissection. The thorax, in that part which was narrower than natural, contain'd a little extravasated blood; and the part, by which it had issu'd from the lungs, seem'd to be, in a manner, eroded, and corrupted.

5. You will ask, perhaps, whether I believe, that such a small quantity of water could excite such great tumults, when even from the *Sepulchretum*

(*d*) Obs. 5. § 2. obs. 7. & in addit. obs. 7.

(*e*) 25. f. 3.

itself (*f*), you learn that Fernelius, and Eraſtus, had declar'd, that an epilepsy was not often brought on from a large quantity, but rather ſoporose diſorders, which our former letters alſo confirm; and even that Willis (*g*), and long before him that Henricus Petrus (*b*), had brought arguments from the ſudden attacks and ſolution of an epilepsy, from which he was led to ſuppoſe, that it could never happen from water: and in thoſe caſes it does not ſeem poſſible to diſprove it, in which nothing at all preceded the attack, or ſucceeded the ſolution, that could ſhew the brain to be in any manner hurt, or debilitated. Yet it does not follow here, that epileptic diſorders cannot be brought on from water in other caſes, and that even in ſmall quantity, as I ſhall declare below, after having firſt produced ſome examples of theſe caſes, which diſagree, one with another, in many circumſtances, and in which I ſhall readily acknowledge, that there was even no water at all. For, firſt, I have formerly heard of a nobleman of Padua, who was ſixty-four years of age; that when he was in his forty-second year, being ſeized with violent anger, and almoſt at the ſame time with his firſt epileptic paroxyſm, he fell down; and after a long time having paſſ'd between, when he had by chance ſeen the perſon with whom he was angry, that he fell down again; and after that, the ſame happen'd to him, even when he did not ſee the perſon, and that repeatedly, till in the two, or three laſt years, he was only ſometimes attack'd with a little kind of privation of the ſenſes; whether becauſe the length of time had now broken the violence of the diſeaſe, in great part, or the powder of tobacco, which, according to the common cuſtom, he had begun to take by way of ſnuff, had diminifh'd the cauſes of the diſorder; for by this means, indeed, much moiſture had been diſcharg'd from the noſe. But although you may believe, that this was added to the firſt cauſe of the epilepsy; yet you will certainly not imagine, that it was then the cauſe of that diſorder, when the ſight of a perſon whom he hated, ſuddenly laid proſtrate a man in the moſt ſound ſtate of health.

6. But when I attended upon that great maſter in the healing part, whom I commended above, Hippolito Franceſco Albertini, I remember that a noble young gentleman, among the citizens of Bologna, and now a moſt honourable ſenator, being ſeiz'd with an epilepsy from a fright, which frequently recurr'd, and uſing, on that account, a drink, in which the herb betony, primroſe, baum, and carduus benedictus, had been boil'd, adding a few drops of the ſpirit of human blood, he began, not only to make more water than in proportion to what he drank, but even to the quantity of ninety ounces every day. But as neither the diſcharge of ſo great a quantity of water, nor the greater laxity of the belly than uſual, diminifh'd the number or vehemence of the attacks, Albertini turning to me, ſaid, though we ſhould by art draw off all the ſerum from the body of this patient, it would be in vain, ſince nature profits nothing thereby. You therefore ſee, that this diſorder was neither primarily, nor ſecondarily, produc'd by ſerum, which the cure alſo confirm'd. For the cure was completed within forty days, not by drawing out the water, which had not been intended, even in the beginning,

(*f*) Sect. hac 12. obf. 2. in ſchol. & obf.
14. § 2.

(*g*) Obf. 1. in ſchol.
(*b*) Obf. 14. in ſchol.

but by quieting the tumultuary motions with sedatives. Twice every day oil was injected by the rectum, but in its simple state, that it might do nothing but relax the distended nerves, and keep them in an undistended state. For by those accessions it was found, that the internal and external nerves, were irritated much more than the cerebrum; and that the patient found much benefit while he was agitated by the disease, if the whole spine was rubb'd with a soft hand, and anointed with oil, recently express'd from sweet almonds, in which earth worms had been boil'd, and to which a little oil of amber had been added. And to those remedies, which the patient took inwardly, opium was added with advantage. And they were such as are judg'd proper against diseases of the nerves, and commonly known: for Albertini did not attribute much efficacy to secrets; which I could wish were circulated in smaller numbers, and of a more certain effect. Among these arcana I have lately heard much extoll'd, a small stone, which is generated in that little animal, that we call among the Italians, *lumacone ignudo*, or the naked snail, yet not so recommended as to cure all epileptic patients; and I have heard that those paroxysms which have their origin from fear, as those now in question had, were much less frequent, from the time that a warm liquor made from the flowers of the herb verbasicum, or torch-weed, in the manner of tea, began to be drank by the direction of a Frenchman. Yet very often, those things which have carried off a sympathetic epilepsy, are cried up to take away also an idiopathic one, not less vainly, than unskilfully and rashly; and hence the number of arcana is uselessly multiplied.

But the medicines, which Albertini made use of in this case, leaving off that which prov'd too diuretic, were reduc'd to that of the human skull, which he order'd to be rasp'd, and beaten in a mortar, and to be moisten'd with the water distill'd from black cherries, then to be dried in the shade; and this process to be repeated often, till it was reduc'd to a pollen, or impalpable powder; for what they call magisteries, he with justice disapprov'd: but from that pollen lozenges were form'd, opium being added to them, and distributed with such care, that scarce more than one grain was in all those which were to be taken at intervals through a whole day.

Perhaps you will ask, whether he took away blood? and blood he did take away, as soon as ever the first attack was at an end, which he would have done, even if no epilepsy had follow'd so great a fright. For he us'd this practice, I believe, because, after his friend Malphigi (*1*), he had observed, as I also have sometimes, that after such an affection of the mind, the blood becomes prone to concrete; from which circumstance many and various disorders arise, and perhaps because, as often happens, some traces of a deprav'd disposition remain impress'd upon the brain therefrom, which are discover'd by unreasonable fears, or terrifying dreams: and blood-letting, as it resists that proneness to concretion in the blood, so it is useful to overcome this kind of convulsive difficulties in the brain.

And he wonder'd, if at any time he heard, that there were any, who, contrary to the admonitions of Cælius (*2*), excited sternutation in epileptic patients, with the doubtful hope, either of changing for the better, the motions

(1) Differt. de Polypos cord.

(2) Morborum Chron. l. 1. c. 4.

of the spirits, or of moving forwards the blood, which was almost stagnated in the vessels of the cerebrum. For who could answer for it, that the motion we would wish to quiet, would not be made worse from thence? And can we suppose, that the blood, which is probably retarded from the fibres being convuls'd, in diseases of this kind, will have its passage expedited from these fibres being still more irritated? Wherefore, he thought this kind of remedy rather more proper in those apoplexies where the passage of the blood was obstructed, by reason of the fibres being extremely relax'd; although, at the same time, he thought it a remedy of such a kind, in general, that it was indeed very rarely to be recurr'd to, by skilful physicians. Nor did he himself, certainly, apply any thing to the nostrils of epileptic patients, besides oil of amber; for those medicines which are call'd spirits, he referr'd entirely to apoplexies of the kind I spoke of just now, and other similar affections, by reason of the injuries observ'd therefrom, in those whom the ancients call'd warm constitutions, and who labour'd under disorders from a warm cause; especially in hysterical women, in whom, when seiz'd with an epilepsy, perfumes of that kind, he had always found, left at least a fullness of the head behind them, if nothing more.

But he chose rather that the patient's head, when attack'd with this disease, should be laid very high, and preserv'd so, as much as could be possibly done; for by this means the humours were less accumulated in it, and the breath was more easily drawn: and he replied to those who perhaps objected, that thus the foam was with more difficulty discharg'd from the mouth, that it would be form'd in the mouth in less quantity, inasmuch as the head and lungs would be less loaded; and, indeed, that this foam did not always, as is generally believ'd, proceed from the lungs, though Pechlinus denies it (*1*), but was rather made from the saliva being agitated in the mouth; for he had observ'd some little streams, as it were, of this fluid, without any foam or froth, frequently flow down from the mouths of epileptic patients, when the head was by chance inclin'd to the other side. But doubtless, while I am led by a grateful regard towards the memory of my preceptor, and by your affection for him also, which I am fully convinc'd of, to pursue his methods and practices in the art of healing, I am carried away too far from the present design.

7. To which, therefore, that I may return, I will just skim over, in as few words as I shall be able, those many things which I have observ'd, for a long time, in my fellow-citizen Anastasio Poggi, a grave and worthy priest. He was in his sixty-eighth year, of a habit moderately fat, and of a florid complexion, when he was first seiz'd with the epilepsy, which left behind it the greatest slowness of pulse, and in like manner a coldness of the body. But this coldness of the body was overcome within seven hours, nor did it return any more, though the disorder often return'd; but the slowness of the pulse still remain'd. The first epilepsy had succeeded to a pain of the right hypochondrium, which was resolv'd by bilious dejections: the other paroxysms, which were slighter, generally succeeded to the sensation of a kind of smoke, ascending up to the head from the hypochondria, the fullness of which parts

(1) De aeris & alim. def. c. 7.

was continually troublesome to the patient, and was certainly increas'd from the ingesta, but especially from liquids. And this being the state of the case, and as the pain of the head, and all the marks of its being affected of itself, were absent, the senior physicians, who had not with'd for me to be their companion, in the cure of this refractory disorder, less than the patient himself, made no scruple to pronounce, that it arose from the irritation of the hypochondria. And indeed, as you have it also in this section of the Sepulchretum (*m*), there is extant in Galen a history of a certain grammarian, "who, having abstain'd too long from food, became epileptic, from no other cause than bile." And examples are very common of adults (*n*), not only of children (*o*), who have been troubl'd with epilepsies, from worms harbour'd in the intestines. And to this purpose also is that observation of Spigellius (*p*), on a whelp thus kill'd by worms; not very unlike to which, is that formerly written by me to Vallisneri, and by him publish'd (*q*). And you know that this disorder often arises, also, from other viscera of the belly being diseas'd, which the section, that I have already quoted, confirms (*r*).

But although that kind of cure was applied to my fellow-citizen Poggi, with my assent, which was proper to open, cleanse, and relax, the hypochondria, yet, nevertheless, the accessions still return'd frequently; so that we now began to fear, lest the head itself had also contracted the injury, especially as, upon a very quick turn of the head, the epileptic insults recurr'd, and left a sense of weight with stupidity in the head; and frequently some blood came, together with the mucus, from the nose. Wherefore, as in the beginning, they had already drawn blood once and again from the arm, nor had omitted to give such things as are generally of use to the head, I persuaded them to let blood be taken away from those veins, which lie about the anus also; and that several things should be given internally, which are recommended as extremely proper against this disease, by the most excellent physicians. These remedies, however, were of no advantage; but the bleeding, whether it reliev'd the head, or rather those viscera which are serv'd with blood by the vena portarum, was so far of advantage, that for a short time the paroxysms were quiet. When, therefore, they return'd again more frequently, it was of use to make the patient sit up, sometimes to rub the lower limbs, and sometimes to tie them alternately with bandages thrown round about, and sometimes to fix cupping-glasses without scarification, and presently to vex the patient by taking them off; for thus he seem'd to have a longer intermission from his paroxysms. And I was even assur'd, that when they sometimes attack'd him much more often, the spirit of salt ammoniac, applied to the nostrils, had driven them away as they were coming on; or, even when they were already, in a manner, begun, had suppress'd them, although the patient was entirely without the power of smelling. They were, for the most part, very short, but by no means slight. For distortions of the eyes, agitations of the limbs, and a suspension of all the senses, always

(*m*) Sect. 12. in schol. ad obs. 19.

(*n*) Ibid. schol. ad obs. 41.

(*o*) Obs. ead. § 2. & schol. ad obs. 15. in additam.

(*p*) Ibid. obs. 41. § 1.

(*q*) Consideraz. in. alla gener. de' Vermi.

(*r*) Obs. 39. cum schol.

accompanied the attack : oftentimes there was a strangulation, and that sometimes join'd together with a stertor ; and even, now and then, an involuntary efflux of urine attended. But he was exceedingly bad that day on which the solstice happen'd, and in like manner, that on which the eclipse of the sun happen'd.

And though you may suppose this might be by chance, yet you cannot suppose it merely accidental, that when the quantity of urine was either naturally or artificially encreas'd (s), the epileptic paroxysms not only became not slighter, but were even very frequently exasperated. For we were oblig'd to have regard to this excretion sometimes, when a sudden difficulty of breathing rous'd the patient, as he was beginning to sleep, and compell'd him to sit up ; which symptom, doubtless, gave us some suspicion of a dropsy of the thorax ; and the more so, because the patient told us, that his right leg had, for a long time past, been accusom'd to swell a little with water, and that even then, which, when he told us, we examin'd into, the swelling was ascending up the thigh. But it was easy to encrease the quantity of urine, by obvious and innocent remedies, and therefore to diminish the tumour, and that suspicion, which was afterwards entirely remov'd ; but not so the force of the attacks, which, from the encreas'd afflux of urine, and that of itself, sometimes opaque, and blackish, was so far from being weaken'd, or diminish'd, that even on the contrary, as I said above, they grew stronger and stronger. When these things, and others, which for the sake of my promis'd brevity I pass over, were of no effect against the inroads of this disease, and even such as had been sometimes useful to retard or suppress them, as I said above, were now of no advantage, as they did not continue to afford these effects ; there was one thing, however, which was constantly of service ; I mean opium, given at the beginning of the night, in the quantity of half a grain. For the frequency and force of the insults, and added to these also, obstinate watchings, so weaken'd the patient in other respects, that we were under a necessity of gaining a truce by some means or other. And by this means, good nights, and easy sleeps, were procur'd to the patient : and so far was his head from being made heavy, or dull, by the use of this medicine, that even the heaviness and dullness, left behind by the daily attacks, were by this means taken away ; which otherwise, that is, when the use of the opium was intermitted, continu'd, while the former restlessness and watchings also oppress'd him. And, indeed, after he had pass'd a night of that kind, which was far more troublesome than the rest, when to the greatest rarity of the pulse, which I mention'd in the beginning, an inequality had suddenly been added, so that very often they were perceiv'd to be even much more rare, then not more so, than usual, and presently much rarer again ; which symptom made us the more uneasy, because the disease, at that time, was wont, first of all, entirely to obscure the pulse, and then immediately to begin its attack ; and when we had tried all the remedies, recommended to dissolve, and promote, the circulation of the blood, in vain ; upon giving the opium again, the quiet nights again return'd, and diminish'd that inequality of the pulse : and, by the continu'd use of opium every night, it was entirely remov'd, and even the former rarity was diminish'd.

(t) Vid. *infra*, n. 11.

But,

But, perhaps, you will suspect, whether the rarity of the pulse be, in fact, a very uncommon symptom, to remain after an epilepsy, in hypochondriac patients, when you shall have compar'd this observation of mine with that of the celebrated Gerbezius (*t*), which describes the pulse of a strong hypochondriac man, "who was now and then subject to slight epileptic paroxysms," even when he was in health, "as being so very flow, that before the subsequent pulsation follow'd that which went before, three pulsations would certainly have pass'd in another healthy person." But to return to my subject; after that no fit had now return'd for thirteen days, and the use of opium was intermitted, the first night indeed was not bad; but the following ones, by reason of the continual watching, and restlessness, and at length by reason of that difficulty of breathing, which I spoke of above, were exceedingly troublesome; so that we were oblig'd to have recourse again to the opium, in order to procure quiet nights, which nothing but opium would procure. And, to comprehend all in a few words; that the attacks of the disease, from being very frequent, as they had happen'd every day, in the month of June, had been so far reduc'd in their number, that but one happen'd in July, one in August, nor more in September, and after that none in the two next months at least, and upwards, till I departed to teach medicine publicly, we judg'd was owing to the use of opium, given opportunely, sometimes every night, sometimes every other night, and at length at the intervals of many nights. For by that medicine we were able to appease the tumultuary motions, which arose, and frequently by a very manifest sensation, from the hypochondria, to the thorax, and head; and by this means procure a truce, both for nature and art: and this gave us sufficient time to cleanse and confirm the hypochondriac viscera, which we had determined to do, in the beginning, but in vain attempted, among those first continual tumults, with which the patient was harass'd: and from these viscera alone, and not from water being redundant in the brain, that these sudden commotions arose, this history, or I am much deceiv'd, indeed, evidently shews.

8. But if you desire other examples besides these, of the epilepsy arising suddenly, either from passions of the mind, in a healthy man; or having its beginning, in a part remote from the brain; you will find many such, among those cases collected by Schenk (*u*): although it is so ancient an observation, of its beginning, "either from the side, the hand, or the foot," that particular mention of it is made, as being then more easily curable, in the second book of Predictions (*x*); which if it be not one of the books of Hippocrates, is at least the work of so ancient, and so much esteem'd a writer, that this passage of his book has been transferr'd into the writings of Celsus (*y*), in the following manner: "Where, in an epileptic person, the sense of the approaching fit begins from any one part of the body, it is best that it begin from the hands, or the feet: next to these from the sides: and worst of all from the head." The force of which ancient prediction, Willis, perhaps, did not sufficiently attend to, when he contended that those very

(*t*) Eph. N. C. Cent. 7. in Append.

(*u*) Obs. Medic. l. 1. ubi de Epilepsia.

(*x*) n. 16.

(*y*) De Medic. l. 2. c. 8.

epilepsies, which seem to begin in a part very remote from the brain, do nevertheless “not uncommonly” take their origin from the brain; as you have it in the Sepulchretum (z). Which though it may sometimes happen, yet that it happens much less often than he imagines, not only the prediction I have mention’d, as it is confirm’d by physicians, teaches, but very frequent observations, if they are rightly attended to, sufficiently prove. And that we may not draw these observations from any other source, than that of the Sepulchretum; turn, I beseech you, to that observation on the epilepsy by Tulpus (a), which was excited “by the mere pressure of a finger “upon the region of the spleen;” then turn to another (b), and a third also (c), of the same disease, beginning from the sole of the foot, or great toe; so that if a tight bandage was timely thrown round the leg, the disease did not proceed: if not, it finish’d its course to the upper parts, and through the whole body.

But there is also an old history, in the books of Galen, which is likewise taken notice of, in the Sepulchretum (d), although he did not say that the disorder arose from the “great toe,” as you will read there, and in the writings of Saxonia (e), but that it had its origin “from the internal part of the “leg;” and he also subjoin’d, what makes much to the present question, but is omitted in the Sepulchretum, that the paroxysm, which was wont to attack the patient, every day, was prevented from returning, after other things, that were prescribed by the physicians, “by binding the limb in the “middle of it, above that part, to wit, which was affected with the primary “disposition.” Other observations I pass over: but lest you think these too few, take thus, what I heard even from one physician, Ramazzini, formerly my colleague and friend, when I happen’d to be present at one of his public lectures; that he had seen several epileptic patients, whose paroxysm beginning from the foot, and ascending upwards, was easily restrain’d by a bandage being plac’d upon the leg. In all these examples, and others of the same kind, can you now believe, that there is room for the explication “not uncommonly” of Willis, when you see, that by the communication being timely intercepted, betwixt that part and the brain, the rising disorder was check’d and prevented; but that this communication not being cut off, neither was the disorder restrain’d? For, if it had its origin from the brain, why did it always go to that part first? or if it could not go to this part, by reason of the bandage being tied about the leg, why did it not go to some other? And that not the least doubt may remain, why does the disorder return no more, if any one take away the cause thereof from that part? Examples of cures of this kind, are extant in the writings, both of the ancient and modern physicians. Let it suffice however, from amongst them, just to point out Marcus Gatinaria (f), who not only directs it to be done, but even confirms it by producing his own observation: and amongst these likewise, that physician, of whom the celebrated Van Swieten (g) speaks, when he

(z) Sect. hac 12. in schol. ad obs. 44.

(a) Ibidem in schol. ad obs. 39.

(b) Obs. 44. in append.

(c) in Addit. obs. 5. in fin.

(d) in schol. cit. ad obs. 39.

(e) Prælect. Pract. p. 1. c. 16.

(f) De Cura Ægritud. ubi de epilepsia.

(g) Comm. in Boërh. Aph. §. 1084.

very learnedly teaches how to distinguish the cases (*b*), in which Willis may be follow'd, from those, in which he ought not to be follow'd, since there certainly are those, in whom the beginning of the epilepsy can by no means be believ'd to be in the brain; those numbers, for instance, of this kind, which we have actually produc'd, and are more than of any other; in whom, to use the words of this celebrated man, "the signs of the incipient paroxysm are always observ'd in the same part, and not in various parts," or in different parts at different times. Therefore, if the beginning is not within the brain, neither can it be attributed to water stagnating there.

But, as I have not only candidly acknowledg'd, but even confirm'd, much more at large than was necessary, if I did not write to you, who particularly require it of me, that there are many instances of the epilepsy, in which the disorder is neither brought on from water being extravasated in the brain, nor does it even seem possible it should be; so I think it must be granted to me also, that, on the contrary, there are cases, in which it may even happen from a small quantity of water: and this I will demonstrate after the next observation.

9. A young man of eighteen years of age, having liv'd in marshy grounds, where his business was to cut down the weeds, with which the coopers stop up the chinks of their vessels, fell, naturally, from his manner of life, into a dropfy, and that a general one. When he was brought into the hospital at Padua, having taken some diuretics, his swelling was somewhat abated; but then he began to be seiz'd with an epilepsy, with which he had never been troubl'd before: the fits of which frequently return'd, on the last seven days, join'd with a silliness, and a propensity to sleep, to which, at length, an acute fever was added. Under such a complication of disorders, he could not but sink.

The head was the only part which underwent a dissection, in that place, on the eighteenth of March, in the year 1741. The face was very tumid, from water lying in the cellular membranes. The skull being taken away, and held up to the light, shew'd the borders of all the bones, which form the true sutures, to be transparent, to the breadth of half an inch. All the vessels that were within the cranium, contain'd but little blood; if you except the lateral sinusses, which contain'd a black blood. Under the pia mater there seem'd to be something like jelly, mix'd with bubbles of air. The cerebrum, but not the cerebellum, was found to be harder than it should be: yet the fornix was lax, and the plexus choroides, which were pale, were still more lax; so that the membrane lying betwixt the right and the left, might be torn by a mere touch only. The anterior part of the left corpus striatum, where it looks towards the right, being compar'd with that which answer'd to it, on the other side, was found to be more protuberating, even at the first glance of the eye: nor was there any danger of deceit in this matter, since the brain, according to my general custom, was dissected in its natural situation. This part, however, was externally sound, and as far as I could judge, internally also; although, at the same time, I ought not to conceal, that the cineritious substance, which is interpos'd with the white striæ, or lines, seem'd

to my worthy friend Mediavia to be, as it were, somewhat porous. Nor did the septum lucidum, nor the pineal gland, nor any part whatever of the brain, which was diligently dissected, shew the least disorder besides those, unless that a little water, of a yellowish colour, was found in the cavity of the lateral ventricles.

10. You have here the history, just as I committed it to paper, when I return'd home, as is my custom: for I distrust my memory on such occasions. Take care, therefore, how you believe that I am easily deceiv'd thereby, if at any time you see any one of my observations propos'd in a somewhat different manner from what is related, by any one of those who were present at the dissection: yet, why this circumstance should happen to the present observation, I can rather wonder, than understand.

But I do not imagine, that you expect I should shew you all the causes of so many diseases, and even of the death of this young man, when you observe, that no part but the head was brought to me to be dissected; and even if the whole body had been dissected quite through, that the cause of the acute fever, for instance, which is, at least, not less fatal than the others, among the number of which it is, generally escapes the eyes of anatomists. It remains, therefore, that we consider, from those appearances which I found in the head, whether there be any thing which we may, perhaps, with probability, suppose to be the cause of the epilepsy, join'd with a silliness, and proclivity to sleep. And I say, there is something which may, perhaps, be suppos'd: for that it was really the cause, or was not the cause, is neither my business, nor yours, nor that of any other man, to pronounce, in cases of this kind. Therefore, setting aside the transparency of the skull, about the sutures, for the state of these sutures was far different from what is believ'd by many to be the cause of epilepsies (*i*), and my observation on that subject is, perhaps, less to be attended to in this young man; I suspect, that in almost all the other appearances which were observ'd, if not the cause, at least the force, which was sufficient to assist the cause of that epilepsy whereof we speak, might be sought for, and conjectur'd: but I suspect, that the chief cause may be plac'd in the water which was found in the ventricles, whether it was in small, or in great quantity, in the living body. It is probable, however, that there was much water in a dropical person: which the paleness of the plexus choroides, in the judgment of Willis also (*k*), seems to confirm; and in like manner, their laxity, and that of the fornix, and that kind of jelly which lay under the pia mater. Nor is it repugnant thereto, that little water was found within the cranium after death. For it might easily happen, than when the head was sever'd from the neck, the much greater part of the water might flow out through the tube of the vertebræ: and if it, therefore, was in large quantity, so much the more did it press upon the lax fornix, in proportion as the remaining part of the cerebrum, in consequence of its substance being harder than natural, resisted so much the more the compression of the water. And the fornix would also be the more press'd upon, in proportion as there was less space in the cavity of the ventricles,

(*i*) Sect. hac Sepulchr. 12. in append. ad (*k*) Sect. proxima 13. obs. 7.
obs. 32. & in additam. obs. 4.

which naturally, and at other times, if not, as some contend for, without space at all, is certainly, in fact, very small; I say, in proportion to the space in the cavity of the ventricles being diminish'd, by reason of the greater protuberance, of one of the corpora striata; whether this had been from the original formation, or had grown out afterwards, by reason of those pores being internally added: and you may see an observation in the Sepulchretum (*l*), of the ventricles of the cerebrum being "too narrow," in an epileptic patient.

But, if you would rather have it, that no water flow'd out from the cranium, and was even in small quantity in the living body; it might also in this way, be the chief cause of that epilepsy, in particular, as it was join'd with a propensity to sleep, and with that symptom, which almost constantly follows it, a silliness or idiotism; or that kind of silliness at least, which is for the most part conjoin'd with it, as we see in persons, who are much inclin'd to sleep. For although a small quantity of water would press the fornix less; yet it relax'd still more, that which was already lax, and by this means might render the man drowsy, and heavy. You will ask, for what reason? Doubtless because, as the use of the fornix is not known, nothing forbids us to suspect its use to be of such a kind, that we are under a necessity of being sleepy, when this becomes lax. Perhaps you will believe I am not serious now. However, I joke very safely; for I maintain that there is nobody, who can demonstrate my suspicion to be really a false one. But let us dismiss this subject, since a propensity to sleep, may, perhaps, not only be accounted for, from that defect of blood, which we saw there was in the vessels of the brain; but it is also sufficient here, as sleepiness has been already explain'd by me, in another place, to shew the only thing, which I undertook to shew, at that time, in the hospital also, that an epilepsy might be excited, either from a small, or from a large quantity of water.

11. For when I had enumerated those marks which are mentioned above, of much water having been previously collected, and had pointed out, for the sake of example, how, according to the dogmas of Bellini (*m*), from too great a quantity of moisture, sometimes relaxing, and sometimes contracting, these, or those nerves, an epilepsy, without even supposing any power of stimulus, may be brought on; this other side of the question however, I only just touch'd upon, being prevented by straightness of time; I mean, that nevertheless, this disorder might also be excited by the power of a stimulus, and even might have been excited in the young man, at present treated of, especially as a mark of stimulus was not wanting, which I there also mention'd, to wit, a yellowish colour of the water. And indeed among those physicians, who flourish'd before the more modern ones, our countryman Saxonia (*n*), was, in preference to others, of the same opinion. Who, as he deduc'd the epileptic convulsion from an irritation of the thin membrane, which surrounds the ventricles of the brain, went so far as to say, "that the water, so it be not mix'd with a bilious juice, and therefore be "not of a yellow colour, or green, does not bring on an epilepsy."

(*l*) Sect. hac 12. obs. 28 & 29.

(*m*) De morb. Capit.

(*n*) c. 16. cit. supra ad n. 8.

It is true, indeed, that there are frequently found in the heads of epileptic patients “yellow stagnating waters, a yellow and acrid serum, a yellowish lymph, and a citron-colour’d serum, which affects the tongue, after the manner of a salt,” as you may understand, even from this section (o), of the Sepulchretum. But yet Saxonia ought to have known, that Coiterus, who was indeed a most excellent anatomist, “had seen many times in epileptic patients,” a water “like” to that, which he had seen in other patients, who had labour’d under complaints in the head; that is, “limpid, thin, and pure;” and this “much more often, than that which was yellow, or like in its colour to bile,” which you have in the same section (p): also to set in opposition to what follows, from Saxonia, a little after, in observation the nineteenth, and especially to that ipse dixit of his, which I just now produc’d; and which you will also read in the scholia subjoin’d to that observation. From the yellowish colour therefore, when water is impregnated therewith, I conjecture indeed, that a stimulus is therein; but do not confine all the means, by which it may stimulate, to that colour only. For who can doubt, but that the “acrid property, and that which affects the tongue in the manner of a salt,” as we mention’d just now, may be latent even in limpid water? You certainly see in the fifteenth observation of this section, “that an epilepsy has sometimes taken its origin from a limpid, warm, and salt humour, almost like the aqua fortis that is used in gilding:” nor in the thirteenth observation does Mangoltius, nor in the sixteenth Hippocrates, speak of the water, which was the cause of the epilepsy, being ting’d with any colour; but the latter indeed says, that he found, in an ill-smelling brain, “an eroding and colliquating” pituita, and the former “a salt, subacid, acrid, and somewhat corrosive taste.” Therefore when you shall read, that Slevogtius (q) found in a dog, who was epileptic, “a turbid and citron-colour’d water” about the ventricles of the brain; or in the Ephemerides Cesàreæ Academiæ (r), that in two epileptic patients, a boy, and a man, “a large quantity of yellowish serum” had occur’d within, or about, the cerebrum; do not more readily suppose, that there might have been a stimulus in these, than where you will learn from the same Ephemerides (s), that within the brain of a young man, and in like manner of a girl, and an infant, a large quantity of “lymph” had been found, as it was, if not as Gerbezius there thought, “without doubt” at least with the highest degree of probability, “acrid.” What if water, by its quantity alone, can irritate? But whether it be much, or whether it be little, so that either by stagnation, or by stimulating particles of any kind, being now and then added, in greater, or in smaller numbers, in proportion to the quantity of water, which then is collected, and in proportion to the tension of the membranes, which are more or less tense, it become irritating; there is room enough for us to conceive, or I am much deceiv’d indeed, in what manner it may then excite an epilepsy; and in like manner also, how it came about, that when the young man we spoke of, had his urine encreas’d by diuretics, that then for the first time, the epileptic paroxysm hap-

(o) Obs. 10. § 2. & in addit. obs. 7, 8, 16.

(p) Sect. hac 12. obs. 6.

(q) Dissert. de Processib. Mammillar. § 33.

(r) Dec. 3. A. 6. Obs. 181. & Cent. 10. obs. 94.

(s) Cent. 3. obs. 14. n. 2. & Cen. 7. append.

pen'd; nearly in the same manner, that Poggi (*t*) had his urine, and at the same time the force of the attacks augmented: for by this encrease of the urinary discharges, the watry humour was drawn off from the body, with which the stimulating corpuscles, whatever, or wheresoever they were, had been diluted; and in proportion as this diluting fluid was decreas'd, in the constitution, the strength of these attacks seem'd to encrease. And, certainly, the cause of so violent a disease is not to be estimated from the bulk of it, but from its power and properties. Thus Fernelius (*u*) found, "at one time about the meninges, and at another time, in the substance of the brain, a kind of putrid and glutinous sanies, in quantity about the bigness of a bean, which was the fomes of this vehement and cruel disease."

In answer to all these things, however, I am not ignorant that two objections may be made; one, that there are persons, who, relying upon observation and experiment, deny, that convulsions arise from an irritation of the membranes of the brain; and the other, that this very water, which we here suppose to be the cause, may, perhaps, be the effect. As to the first objection, I shall have a proper occasion of examining into that, below (*x*); and as to the latter, it is by no means necessary, that I go about to discuss it, either because water is not always found in epileptic patients, though convulsions have always preceded, which even that very section of the Sepulchretum teaches (*y*); or for other reasons; since I think it is quite sufficient, on this occasion, to retort one thing, which is, that I do not affirm for a certainty, that water is sometimes the cause of an epilepsy, but only suspect, and conjecture: and it is by no means fair or equitable, to suppose, that one suspicion is entirely rooted up, by another suspicion being objected to it. But let us go on to other observations of my own, or those of my friends, in which water was sometimes found, and sometimes not.

12. A man, who exercis'd the business of a cook, having been before subject to disorders of the urinary passages, was brought into the hospital of St. Mary de Vita, at Bologna, on account of a violent and continual fever, with which he had been seiz'd. I saw the blood that had been taken from him, which was so concreted in the glass vessel, into which it had flow'd, that adhering all round to the sides thereof, it had squeez'd out all the serum above it, which was in small quantity, and bloody. He continu'd to grow worse, especially in an evening. About the twelfth day from the beginning of the fever, he died epileptic. As I had not paid much attention to this man's disorder, so neither was I present at the dissection; which was perform'd by the gentleman who afterwards gave me the narration, Sebastian Anthony Trombelli, at that time a very diligent student, but afterwards a very eminent physician, and surgeon, at Bologna.

The belly had nothing worthy of notice, except the kidneys: one of which, being round, and in some measure resembling a cancer, contain'd calculi within it; but the other, I suppose, because it supplied the office of both, was almost twice as big as it naturally should be. The thorax, beside an inflam'd pleura, exhibited the heart and great vessels turgid with a very

(*t*) Supra, n. 7.

(*u*) In addit. ad hanc sect. obs. 2.

(*x*) N. 21.

(*y*) Obs. 34, 36, 38, &c.

black and fluid blood, which was then quite warm, though ten hours after death. Finally, in the head, all the small vessels, whatever, that creep on the surface of the brain, were very red and turgid; and in the ventricles of the cerebrum was a little quantity of water, and that limpid, like lymph.

13. If you do not chuse to lay any thing to the charge of the water here, you may ascribe the epilepsy to the state of all the small vessels of the brain; which being so distended with a blood of this kind, that was also agitated, and comminuted by the fever, distracted the pia mater, in which they are inwoven, and could not but irritate it. But if the epilepsy does not attack all in whom the vessels are thus turgid, perhaps the cause of the difference is to be sought for, in that membrane's being in a state of less tension. The same section of the Sepulchretum, which we are now upon, certainly shews, that not a few persons have fall'n into epileptic paroxysms, from these vessels being distended. For, to pass by the twentieth observation, which is again propos'd also under number thirty-three; the second observation in the additamenta, which itself likewise is again repeated, with the same inconsiderateness, under number eleven, exhibits part of the cerebrum "inflam'd;" the sixth, those vessels "tense and turgid;" and the fifteenth, "very turgid." But you will say, that in all those bodies there was not only a turgescency of the vessels, but also extravasated blood, in the cavity of the cranium. I confess it; but in all these, likewise, there was not only an epilepsy, but moreover an apoplexy, and that a most grievous one, if you attend to it, which succeeded to the epilepsy: so that it is natural to conjecture, that so long as there was only a distension of the vessels, though they were very near upon rupture, by the distraction of the fibres of the pia mater, an epilepsy alone was produc'd; but when they were already ruptur'd, and their contents pour'd out, that then a fatal apoplexy was the consequence. And lest you should happen to think, that this is just said at a venture, read the following very short observation, which my friend Nicolaus Mediavia communicated to me.

14. A porter, about forty years of age, having on those days, that is, about the middle of August, in the year 1729, been exercis'd with much labour and fatigue, even more than he was accusom'd to, and having also over-fill'd himself with food, but especially with fruits, fell into an epilepsy, which he had never before been troubl'd with; and being brought into the hospital, he died in a few days. The head, which was the only part disected, had nothing at all in it worthy of attention, if you except the turgency of the vessels of the cerebrum.

15. If you read over the case of Apellæus Larissæus, which you see mention'd in the last scholium to the nineteenth observation of this section, in the fifth book of Epidemics, from whence it is taken (z), you will see, that it was so far similar to this just describ'd, that he was carried off by a disorder of that kind, when he had been "very voracious of a great quantity of food," "and had wrestl'd, and strain'd himself much." And at the same time you will confess, that to guard against epilepsies, especially of this kind, the blood should neither be agitated by great labours and fatigues, particularly in the summer season, nor be increas'd by great quantities of food, especially

of the fermenting kind; and that, if by accident it has been encreas'd, it ought to be diminish'd by convenient bleedings, according to those happy examples of the physicians, which you will find taken notice of in the scholia to observation the thirty-fifth, and in the third place. From which you may understand, that although the distension of the sanguiferous vessels within the cranium, was not itself, as we conjecture in a certain disposition of the meninges and cerebrum, the very cause of the epilepsy, yet it will not be altogether a useless matter, to know, what can, at least, cherish, and encrease the strength of the cause which gives origin to the disease. And I would have you suppose this to be said in regard to some other appearances, which were seen by me, not only in the cerebrum of epileptic patients, but in others also; as the former letters, compar'd with this, will shew. For whatsoever I find that is preternatural, in the dissection of any body, I never suppress; but enquire, whether of itself it could be the cause of the foregoing disorder, or only when join'd together with others; generally, however, making probable conjectures only, and seldom absolutely deciding upon any thing. Nor does it all escape me, that it is possible, the true cause of the disorder may be altogether imperceptible to our senses; and that not only in these, whose nature, where the brain is concern'd, is so particularly abstruse, but even in many other disorders also: and that for this reason, sometimes, no traces of injury whatever were any-where found in the brain, by the most inquisitive and penetrating men, after an epilepsy, which had even been idiopathic, as some observations, which are transferr'd into the Sepulchretum, teach us (a); although, indeed, there is room to doubt, whether all these observations were taken from patients, who had labour'd under an idiopathic epilepsy: and Saltzmann did very prudently, when he conjectur'd, in regard to the first of them, that the woman who was said to be epileptic, and had no diseas'd appearance in the brain, "either had not labour'd under an epilepsy, or that "the epilepsy had been sympathetic, or from consent." And, indeed, Thomas Bartholin also says (b), "An epilepsy from the consent of the inferior parts, "seldom leaves any traces behind it in the brain." But let us come to those disorders which are manifest, and peculiar to the brain itself.

16. A woman, aged sixty years, who had for almost two years been subject to an epilepsy, was at length receiv'd into the hospital, about a month before her death, after having got a blow upon her head, by falling down in one of her fits. At first, no external signs of injury appear'd upon the cranium, nor yet any internal symptoms of the brain's being injur'd. It was afterwards understood, that the blow had been receiv'd on the middle of the os bregmatis, on the left side; yet when the bone was there uncover'd, no lesion appear'd. And in regard to the brain, that was no-way affected, but by the epilepsy, which was a disorder of long standing; and its paroxysms generally recurr'd after this manner. The patient at first trembl'd slightly, then lay in a manner rigid, immoveable, and silent, till she came entirely to herself. Then, indeed, she might once have been thought to be delirious; if it had not rather been believ'd, that she answer'd less properly to any question, from a kind of stupidity, which was left behind, by the epileptic attack, from

(a) Sect. hac 12. obs. 36, 38. § præsertim 2.

(b) Cent. 2. Hist. Anat. 92.

which she had just emerg'd. But last of all, there was an evident delirium; and this was join'd with an acute fever, which however was slight, nor attended with any mark of the brain's being affected with any disorder besides this. And even on the three or four last days, the pulse being quite sunk, she was perfectly sensible, till at length she died about the middle of December, in the year 1741.

Beside the head, I dissected only the urinary and genital parts. In these nothing appear'd which was not natural, except the fund of the uterus, whose internal surface we found entirely of a blood colour, degenerating into blackness; yet in such a manner, that this colour did not penetrate deeply into the substance of the uterus. And that this was not to be imputed to the menstruous blood, not only the age of the woman was a presumption, but even the pressure of the uterus between the fingers confirm'd; for by that means no blood came forth. The cranium being diligently examin'd, on its internal surface, offer'd nothing, indeed, that was worthy of remark; although, externally, that part of the bone was red, which I mention'd above. Moreover, although the posterior and external surface of both the fincipital bones appear'd to be, in a manner, depress'd, yet nothing was seen, internally, corresponding thereto, which was found to be unusual, or preternatural. The meninges were every-where found, so as not even to have any fullness, or distension, in their vessels. But scarcely was the dura mater taken off, when we observ'd, that in the left hemisphere of the brain, the third and anterior lobe was much lower than its fellow, and much softer; and not only in the upper part, but entirely throughout its substance, the basis, as well as the other parts, not excepted. Without doubt, it had sunk thus by reason of that softness; which was very evident in the cortical substance, but much more so still in the medullary. For this last, in particular, was chang'd into a kind of jelly, in the greatest part of it, which was of a cineritious colour, degenerating into brown, and yet almost transparent. And this disorder had also affected the anterior portion of the lateral ventricle, which was comprehended within that part of this hemisphere pointed out. There was nowhere any strong, or disagreeable smell; no-where any pus, or any thing bloody, in this jelly: so that it seem'd to be a disorder of a peculiar kind. In the remainder of the cerebrum, and cerebellum, every thing was found; so that scarcely as much water as could be contain'd in a spoon at once, which was, perhaps, somewhat red from the blood that had been mix'd with it, in dissection, was found in the lateral ventricles. Yet a little quantity of water had flow'd out, while the cranium was saw'd round about.

17. It seem'd very surprising to every one, who was present at the dissection, that this woman had liv'd so long, with so great disorder of the brain, as is describ'd above; whether this disorder had begun before the blow, which her head had receiv'd, or its origin was to be dated from thence. The latter of which suppositions seems to be argu'd, from the injury of the brain being situated on the same side, where the blow had been receiv'd. Yet if this was the cause of the epilepsy, a disease which had so long before infested the patient, it must necessarily, according to our former supposition, have existed for a long time, before the blow was inflicted. Nor am I without having other examples, of a corruption, or rottenness of this kind, without any
previous

previous blow of the brain; one of which you will easily acknowledge, in another woman, if you read over again the fifth letter (c); although that medullary substance of the cerebrum, which was in a manner colliquated, and inodorous, had something of a bloody mixture, and had brought on an apoplexy, with a palsy on the opposite side of the body; and not an epilepsy, although it took up much less room, than the disorder we at present treat of. But this difference is perhaps to be attributed to the different part which it occupied, to wit, the side of the optic nerve, which ought particularly to be attended to; at least as much as the other example, that I am going to relate, will permit.

18. A man of a low stature, and a slender habit, being seiz'd with a violent return of the epilepsy, which he had been before wont to be afflicted with, was taken off thereby, in a very few days. On diligently examining the principal parts of the body, after death, in April 1722, I observ'd, that in the abdomen, the right kidney was larger than the left. In the thorax were here and there little beginnings of ossification, in the curvature of the aorta. In the head, besides unequal dilatations, in some parts of one of the vertebral arteries, and that into which it open'd, call'd basilar, by the celebrated Winslow (d), there was nothing at all in the other vessels, worthy of our attention, which were neither empty, nor præternaturally distended with blood. Nor was water any where extravasated. But at the extreme part of each thalamus of the optic nerves, the colour degenerating from yellow to black, made a discovery of the disorder, in the medulla which lay under it: and indeed, to as great a depth, as this substance was ting'd with that colour descending into it, so far was it softer than it ought to be, and appear'd in a manner half-corrupted, to those who look'd upon it.

19. Has that "spot" any reference to the present case, concerning which, the passage of Henricus Petrus is quoted in the Sepulchretum (e)? "In the dissection of those, who have died of an epilepsy, no trace of obstruction appears, but sometimes a spot, sometimes a black humour, and frothy, and sometimes nothing at all." Certainly the spot in both the examples produc'd (f), was a discovery to me of the disorder that lay near it, which by cutting deeper into it, was of itself fully discover'd. But to this peculiar kind of corruption in the brain, this seems to relate, which was observ'd in that great man Alexander Marchetti, who was taken off by a violent apoplexy, after having suffer'd two attacks of an epilepsy, within the space of a few days (g). For "the cortical substance of the brain was very tender, so that by a slight touch it was converted into a fluid substance, as if it had never coher'd." And that corruption, also, has an affinity with this, except its being much deeper, which Ernest Gotl. Schmidtius (h) saw in a soldier, after very grievous pains, and other disorders of the head, that were the consequence of a blow thereon; and, in like manner, that which Carlo Curti (i) observ'd in a young woman, after an apoplexy. For the first not only found:

(c) n. 6.

(d) *Expos. anat. tr. des arter.* n. 99. & seq.

(e) *Secl. hac* 12. obf. 14.

(f) n. 17, & 18.

(g) *Eph. N. C. cent. 7.* in append.

(h) *Obf. Chir. Tetr.* obf. 3.

(i) *Discussiōni di. un raro morbo cutan. &c.* in una nota.

a transmutation of the whole right hemisphere of the brain, so that its substance "was like a kind of pretty fluid jelly, or rather a colligated matter, " which flow'd abroad with the least touch;" but the same transmutation also "had in like manner proceeded in various places" to the left hemisphere. And the other found the whole right hemisphere, and its meninges, chang'd into a mucous substancè; so that following the point of the knife, which rais'd it up, it was drawn out, after the manner of a thread. But the anterior extremity of each hemisphere, in a man whom the celebrated Kaavius dissected (*k*), had pass'd into a more evident abscess, or at least not a disorder of this kind, though the man, and his history, were both unknown, as he was found dead in the public way. For the cortical part of the brain "was converted into a fœtid, yellow mucus, so that the vessels of the pia "mater floated loosely therein." Here you see the disorder had a fœtid smell attending it, which is spoken of in no other of the observations, that have been produc'd, and even in one, is expressly deny'd, and was certainly wanting in the four made by me; the last of which I took from an old woman who died of an apoplexy, and shall send the account of to you, on another occasion (*l*). But, to return to the woman who had the contusion on her head (*m*); whether the disorder, which we found in her brain, had its origin, as in the three others dissected by me, and, in like manner, as in Marchetti, and the woman that Curti mentions; or whether it was rather the consequence of that blow, as in the soldier whom the celebrated Schmidtius speaks of; I leave entirely to your judgment to determine, and even still more in one, and another, of whom I shall now give you an account.

20. A man being stricken on the head, by a log of wood falling upon him, was thereupon seiz'd with an epileptic disorder, to which it was said he had been before liable; however, he was certainly attack'd with them much more often, in the few months which he liv'd afterwards, and still more often in the last week of his life. He was besides, shaken with so great a tremor, that they were oblig'd to confine him with bands, lest he should fall out of bed. An amaurosis also had come on; for he now discern'd nothing, although no disorder appear'd in the eye, beside a dilatation of the pupil. But as to the other actions, which are call'd animal actions, he neither complain'd himself, nor did he seem to others to be injur'd, unless that he was not quite so ready as usual, in answering, when a question was ask'd him. Being thus affected, he died away by degrees. The head came to me to be dissected, when I was teaching anatomy in the college, in the month of February, 1728. The upper part of the cranium, if you except some places, in which it was naturally thick, protuberated inwards, and was every where so thin, that it was hardly credible. And even in one place, which belong'd to the right bone of the sinciput, it had a foramen almost of an elliptical figure, a little less than to admit the point of a little finger, shut up with a membrane, without the least sign of caries round about the edges thereof, or any where in the whole cranium. Nevertheless, to this foramen, which was shut up as I have describ'd, a little foramen, in the dura mater beneath it, corresponded,

(*k*) Nov. Comm. Acad. Sc. Petropol. T. 1.
obl. Anat. 3.

(*l*) Epist. 57. n. 14. Vid. & Epist. 60. n. 4.
(*m*) Supra, n. 16.

from which a serum of a brown colour issu'd out. This small foramen communicated with a cavity, big enough to receive the bulk of a large egg, full of the same kind of brown serum, in which a small quantity of coagulated blood had subfided. This cavity was of an irregular form, and had an unequal surface internally; and the parts of the brain, which were nearest to it, round about, had lost their natural colour, and were ting'd of a dirty brown, which was an indication of the substance being half-corrupted: but more especially, that part of the basis of the cerebrum, which is plac'd upon the posterior region of the right orbit, and also the anterior part of the right corpus striatum, which lay above that. And even the thalamus nervi optici, on the same side, although it was pretty remote from the cavity, yet seem'd to be shrunk and wasted. Yet both of the optic nerves, when inspected on the inside, and on the outside, of the cranium, as also the several parts of both eyes, though diligently dissected by me, shew'd no fault, or disorder, any where, that could fall under the notice of the senses, whether I consider'd the colour, the magnitude, the firmness, or the structure thereof. But although the left hemisphere had none of those appearances, which were remark'd in the right; yet in the left lateral ventricle was much pellucid water, and the plexus choroides were pale, and colourless, with a few small vesicles upon them: the whole cerebrum also was of a dirty yellowish colour, and its vessels were very turgid with black blood. Finally, the pituitary gland was very much depress'd, and small, but not hard.

21. Concerning the amaurosis, which had fall'n on each eye, although the brain was only injur'd on one side; this is not the proper occasion of examining into it (*n*); nor yet in regard to those continual tremors, or, if you chuse rather to call them so, convulsive motions. But in regard to the abscess exciting the epilepsy, or at least much more frequently than usual in the same man, I would have you compare therewith, the dissection of Alexander Marchetti (*o*), above pointed out; for in his brain, beside what I have there taken notice of, there was also an abscess not very dissimilar to this. You have besides, in the Sepulchretum (*p*), the observations of Fernellius and Smetius; the former of which, though you will see them repeated in another place, I had rather you would read in the first place they are spoken of, where he says, in regard to the epilepsy which has its origin from the brain, "that he had sometimes found the cause, to be an abscess of the cerebrum: " and sometimes a corrupted portion of the meninx, adhering to the skull." For in the history given by me, you have both causes to recur to, that is, the abscess of the cerebrum, and a corruption of both the meninges, though but small, brought on from the most filthy humour, which had corroded and perforated them. But Willis, you will say, did not admit of this second cause; inasmuch as he, as you will also read in the Sepulchretum (*q*), neither from an abscess form'd in the dura mater, nor from the most fetid pus, discharg'd from thence, and corroding the pia mater also, nor even from a great laceration, by the trepan of an unskilful surgeon, did ever see any disorder of an epileptic kind brought on. And I, besides these things, am by

(*n*) Vid. epist. 13. n. 6.

(*o*) n. 19.

(*p*) Sect. hac 12. obs. 2. & 21. n. 1. & 2.

(*q*) Ibid. in schol. ad obs. 1.

no means ignorant of the experiment of Ridley (*r*), that he made upon a dog, which, after a perforation of the dura mater, “was free from convulsion of every kind.” None of all these things would I dare to deny. I will rather seek the reason of the difference between these, and the contrary observations, and contrary experiments of other persons. And to contract my discourse upon many things, into a few words; you have doubtless read in the history of the Royal Academy of Sciences at Paris (*s*), that in a young man who had labour’d under an epilepsy of long standing, and which, in process of time, had encreas’d in the number and violence of its accessions; the cause thereof was found to be, some exceedingly small bones which had their bases in the dura mater, and their very acute apices, or points, so turn’d against the pia mater, that they could not but prick and irritate it, and so much the more, the more they encreas’d. You have also seen, to pass over other experiments of the Italians at present; you have, I say, seen in the commentaries of the academy of Sciences at Bologna (*t*), that when the celebrated Peter Paul Molinelli “often prick’d the dura mater,” which was partly laid bare, in a living dog,” he observ’d that the dog was distorted, with various convulsions, “especially when that part of the dura mater was “prick’d, which adher’d the most closely to the bone.”

Shall we therefore account for the apparent difference from this latter part of the experiment, and conjecture that which reason itself seems also to confirm, that unless the meninges are equally tense, equal effects are not to be expected from their irritation? And this greater tenseness may be brought about, not only by an adhesion to the bone, but by other circumstances also; as for instance, by a distension of the vessels in both of the membranes, and by too great a hardness of the cerebrum in the pia mater, that immediately invests it. Which two appearances, you will remember, were remark’d by me, in some bodies, that I spoke of above (*u*), and particularly in this which I speak of at present; and if not conjointly, at least separately. For thus you will more readily admit the conjectures, which I advanc’d in respect of these patients, concerning the irritation of the membranes of the brain. And after the same manner also, you will be able to understand that which is related in another part of the history of the Royal Academy already commended (*x*), of the sharp points, or prickles of little bones, sticking out from one side of the upper part of the sinus of the falx, and exciting epileptic paroxysms, without any alleviation, except from large evacuations of blood. On the other hand, in the dog spoken of by Ridley, “a hemorrhage” had preceded the perforation of the dura mater, which, if it had been slight, would not have been mention’d by the author of the experiment. And from this cause, with so much the more ease, a laxity might happen, as that part of the dura mater which was perforated, no more adher’d to the bone. And nothing forbids us to suspect, that in one or two observations of erosion, or perforation, of the dura and pia mater, industriously, perhaps, selected by Willis, from a great number, to suit his present purpose and opinion, there were at least some causes of laxity, if not of the same kind as these: which laxity, if

(*r*) Act. Erud. Lips. M. Maj.

(*s*) A. 1711. obs. Anat. 6.

(*t*) Tom. I. ubi Anatomica.

(*u*) n. 9, 12, 14.

(*x*) A. 1734. obs. Anat. 2.

it had existed in the young man, and in like manner in that general, one of whom you read of in the fourth observation in this section of the Sepulchretum, and the other in the twenty-seventh observation, and more at large in the first section, observation sixty-nine, though erroneously mark'd by the printer forty-nine, I believe the dura mater "being eroded" with pustules, would not have brought an epilepsy on the former; nor in the latter "a pretty large bone, that was sharp like a star stone, would," with so much ease, "have" given occasion, by the point thereof, to the inflammation, and corruption "of the dura mater, join'd with an epilepsy."

22. But that sharp bone found "in the middle of the brain," as it hurt the dura mater by its point, makes me conjecture that it was plac'd betwixt the two hemispheres; so that it belong'd to the falx, and the neighbouring parts of the meninges, and not to the substance of the brain; especially as the author of the observation, in order to remove all suspicion of the bone having, perhaps, fall'n down, from the nearest part of the cranium, which might formerly have been broken, into that place, has by no means said what he ought not have omitted to inculcate, that there had never been any previous, violent, and constant symptoms of that substance being wounded; but has only added, "that no mark of the cranium having been formerly broken, "or of a remaining cicatrix, was observ'd." Which words put me in mind of obviating your doubt. For you may, perhaps, enquire, whether I think, that, in the man of whom we now treat, the foramen, which was observ'd in the skull, is to be attributed to the bone being taken away, by the surgeon, after a blow, or to the bone being formerly eroded? But I cannot admit, on this occasion, either one cause or the other, since I know that no mention was made of surgery having been applied to, in consequence of the blow; and I saw no trace of a cicatrix, either above, or below the foramen, nor the least mark of the bone having ever been affected with a caries; so that I have sometimes rather been tempted to think, much in the same manner as Lancisi did (y), in relation to a foramen almost similar to this, found in the same bone of an apoplectic man; I mean, that the bone had been imperfect from its original formation, nor that this part of the bone had been fill'd up; especially, as the general thinness of the cranium prov'd an original deficiency of bony matter. Nevertheless, when, on the other hand, I call to mind the abscess describ'd in the brain, and the cavity of it, which was subjected to that foramen, and in the same place, the two meninges pierc'd through with a small foramen, which communicated with the cavity, I confess, that I am not a little in doubt upon the decision. Wherefore, I will rather add, in this place, the observation of Nicolaus Mediavia, which you may compare with this; for in that an abscess of the cerebrum, and an epilepsy were, at the same time, join'd with certain erosions of the cranium.

23. A woman had two venereal tumours, in the upper part of her forehead, of the same kind with those that are call'd "gummata." Mercury being given to her on that account, a salivation was excited. In consequence of which, the left tumour subsided, but the right remain'd. And where the tumour had subsided, a pulsating protuberance appear'd. It was certain,

(y) De Subit. Mortib. obs. 1. mortuor.

that the woman, before the use of mercury, had been subject to an epilepsy: and once indeed in the middle of the cure, and again, when this was completed, she was agitated with convulsions, attended with a foam flowing out of her mouth. At length, without having any part of her body affected with a paralysis, but lying for some days, in a kind of sleep, as it were, so that she seldom spoke, she died, about the middle of October, in the year 1739.

Upon diligently examining the cranium, and cerebrum, it was found that the prominence, which I mention'd above, was cover'd over with a kind of membrane, not thinner than that thickest sort of paper which is commonly call'd pasteboard, but flaccid; so that being rubb'd together, betwixt the fingers, it was easily broken asunder. This membrane occupy'd the place of both meninges in that part; for the cortical substance of the cerebrum was immediately under it, which was from thence, quite to the medullary, much harder than it ought to have been, that is, not less hard, than the substance of the liver. But the remainder of the left hemisphere, except the posterior part, was, on the contrary, much more soft than it naturally should be. And within it was a cavity, of the bigness of a small wallnut, contain'd within very soft and livid parietes of the medullary substance; from which, having an aperture at the upper part, a humour, at first blackish, then of the colour and consistence of serum, in which a kind of filaments swam, flow'd out; not having any ill smell whatever. This cavity lay over the anterior part of the lateral ventricle, with which, however, it did not in the least communicate; nor yet with that prominence which is describ'd; and was even distant from it about two fingers breadth. But in the cranium was a foramen of an elliptic form, corresponding to this prominence, having its borders every where equal and regular, as if they had been smooth'd down with a file. These were the appearances on the left side. And on the right was nothing worthy of remark in the cerebrum. As to what belongs to the brain; the tumour on the right, which had not subsided, had not yet penetrated, by its corrosion, to the internal surface of the bone. But in the other place, where the bone was entirely wanting, a kind of thick membrane lay beneath: was it because the other tumour, upon taking of mercury, had fall'n away from thence before?

24. If you compare this dissection with those few, in this section of the Sepulchretum, *De epilepsia*, which we are now upon (z), that relate to the venereal caries of the cranium, and gummata; you will, perhaps, set the greater value upon it, because it shews what has been the consequence of gummata in the cranium, and the cerebrum, that was situated near them. But you will not, I suppose, imagine, that the abscess belong'd altogether to the gummata (a); as, on the other hand, you will, no doubt, judge that the hardness, which was left in the cortical portion of the cerebrum, lying under the gumma, had a reference thereto. And yet it is certain, that both the one and the other are sometimes met with in epileptic persons. But as to the abscess, since this is evident, even from many observations in the same section (b); I will pass over that, to point out some upon the hardness of the

(z) Obs. 3. & in Additam. obs. 3.

(a) Vid. tamen epist. 58. n. 9.

(b) Obs. 2, 20, 21. §. 2. & in Addit. obs. 5.

brain. Wherefore omitting those, which refer to the firmness of the whole cerebrum being greater than natural, one of which kind is in the same section (*c*), another in the History of the Royal Academy of Sciences at Paris (*d*), and a third above describ'd by me (*e*); you will remember that Anthony Pacchioni (*f*) has remark'd the hardness of a certain part; for in an epileptic cardinal he found the cortical part of the cerebrum, where it answer'd to a large hydatid, "grown to such a consistence as to resist pressure, and to seem entirely schirrhous;" and that the celebrated John Fantonus (*g*), in the head of a boy, who had been carried off by an epilepsy, had found "a portion of the corpus callosum of the cerebrum, very hard, and no other morbid appearance." Add to these gentlemen, the celebrated Abr. Kavavius (*h*), and Balthasar Walthieri. For the first in a marine soldier, who had long been subject to epileptic attacks, and in the last of these, which was by far the most violent, had suddenly died, observ'd, among other things, that the cortical substance of the brain was not only every where "much indurated, but in many places schirrhous, and in others, in a manner, cartilagineous, especially the nearer it was to the vertex." And Walthieri, together with other observations which I have before (*i*) mention'd, sent also this to me, the substance of which I will immediately commit to writing.

25. A man aged thirty-five years, of a slender habit, being seiz'd with a pain in the head towards the forehead, join'd with a sense of weight, and having tried a great number of remedies in vain, which for the space of two years before had been prescrib'd him by the most celebrated physicians, fell into a flux of blood from the nostrils, which, after having been discharg'd in great quantity, ceas'd of itself to flow any longer. After this he was depriv'd of the faculty of smelling, and then seiz'd with epileptic insults; and with these he was very often afflicted for two years, till at last he died. The skull being open'd, nothing was found preternatural, except at the anterior parts of the cerebrum, where, on the left side indeed, some little quantity of blood was extravasated, but on the right, towards that process, which anatomists call the crista galli, the cerebrum itself was hard, and callous, and was found to be very closely connected with the dura mater.

26. It is probable, that the animal spirits are put out of their course, and reflected into tumultuary motions, as often as being more swiftly agitated, from any cause whatever, they come to some certain places of the brain, which by reason of a callous hardness, or an interpos'd abscess, are altogether impervious: although, indeed, it seems, that even the abscess alone may, by emitting something from itself into the neighbouring parts, excite tumults in the brain. However this may be, if from the hardness of the cerebrum, or from abscess, or an impostume sui generis, or from a distension of the vessels, or from water in large quantity, or small, yellow or limpid, or if from any other causes whatever an epilepsy may have its origin; or whether you choose rather to consider any of these circumstances as effects, rather

(*c*) in Addit. obs. 8.

(*d*) A. 1705. Obs. Anat. I.

(*e*) n. 9.

(*f*) Epist. ad Srok.

(*g*) in Pacchion. Animadv. 22.

(*h*) in Comment. cit. supra ad n. 19. obs. Anat. 2.

(*i*) n. 3.

than causes; but do not deny that the disorder may be preserv'd, cherish'd, and encreas'd thereby; you certainly see, upon any of these suppositions, how difficult the cure of it sometimes will happen to be, and so far even as to exceed all the force and power of art. You also see, when the epilepsy is not beyond the reach of art, how various the method of cure ought to be; and that not only when the cause is without the cranium; of which species, together with its various treatment, I have given you some examples above; but also when it is within the cranium. And for this reason physicians are sometimes deservedly, and sometimes undeservedly, accus'd; but deservedly, in particular, with great reason, those who attempt the cure of every epilepsy, indiscriminately, in one method and manner. But this necessity of a various and manifold method of cure, which is abundantly evident from other disorders also, causes the greatest difficulty in the art of healing properly: and as anatomists are always demonstrating this more and more, by discovering the various causes of one and the same disorder; so I would to God, that physicians, by more accurately observing the various signs of these various causes, might equally still more and more extenuate and lessen this difficulty; and this indeed is by no means to be altogether despair'd of, so that both the anatomists, and physicians, shall unanimously concur, as is their duty to do, the first by accurate dissections, and the last by diligent observations, every one to act his part well, in an affair of such great moment. Both of which, or at least one or other, I beseech you to undertake; nay rather see to it that you do, if you find that I do not desert my posts. Farewel.

LETTER the TENTH.

In which Convulsion, and Convulsive Motions, are treated of.

1. **T**HESE disorders, which are treated of in the thirteenth section of the Sepulchretum, are often so complicated with others, that in most of the observations belonging thereto, Bonetus expressly admonishes us, that they relate to other sections of his work. However, as it is by no means my custom, not only in any one section, to repeat the same observations, which every now and then escapes him, and even in this very section (a); but as it is even not customary with me, to repeat the same observations in different places of the same work, do not expect, that I should here give you a great number relative to this disorder, which is at all times not uncommon: but if you would have a large number, you will seek for them in those letters which I shall send to you at another time, especially in those which

(a) Confer obs. 7. cum 22. §. 1. obs. 13. cum 33. obs. 19. §. 2. cum §. 4.

relate

relate to wounds, or even in the greater part of those that I have already sent, and besides the others, in the last. For without convulsive agitations, a true epilepsy can by no means happen; although convulsive agitations may happen, as we frequently see, without an epilepsy. The plain and certain reason of which difference, I would have you demand of him, who supposes that he knows, what motions are made in the brain, and in what part they are made, when we perceive, or in any manner think. I, who can give nothing but conjectures, had rather produce histories than conjectures, which, if they are in any measure definitive, must be entirely romantic here, and, if we would make probability our guide in conjectures, would be here too generally and universally devis'd. Yet I use the latter rather than the former, whenever it is necessary to use them; such, that is to say, as seem far less liable to errors, and stand in need both of fewer words and fewer postulates than others, and these, postulates, which are so easy and perspicuous, that they are more often suppos'd than express'd. As for instance, if I say, that the irritation which causes convulsions, if it be of such a kind, that it can either by force, manner, or place, or in any other way whatever, intercept, or altogether pervert, for some time, the motions which are perform'd in the brain, in order to perceive, or think; that then not only convulsions, but an epilepsy itself, will be brought on thereby. But let us go on, first, to the histories of Valsalva, and after that to mine.

2. A young man, about twenty-six years of age, had first a slight swelling of the fauces; and his appetite was pall'd. To these complaints, after some days, a convulsion of the left arm was added, so that it was entirely immoveable and inflexible; and soon after, the same thing happen'd to the whole body, of a sudden, which had happen'd to the arm: so that the patient now was not able to move himself to any side, but continu'd stretch'd out in a strait posture, as he was taken, his body being immoveable and rig'd, except that, a little while after, he was able, in some measure, to move his hands and his feet only. He was brought into the hospital of St. Mary de Vita, at Bologna, where the fever and convulsion, with which he had been seiz'd, were found to be that disorder which the Greeks call *tetanos*. From the first day, in which he was seiz'd with it in his whole body, even to the very day of his death, he had profuse sweatings. But, on the beginning of the fifth day, death was the consequence of a new contraction, which bent his body entirely to one side.

On the skin of the body after death were many red spots; but in the brain nothing occur'd worthy of observation, except a little serum, and that saltish, in the left ventricle. The thorax being open'd, in its left cavity, some ounces of water were found: both lobes of the lungs were very red, especially in their posterior part: the pericardium was entirely full of serum. The blood had lost but little of its natural fluidity.

3. To this disorder, which is not very frequent, that moreover was added, which to our Mercurialis (*b*) would have seem'd much more rare; I mean, that the body should be bent, to one or the other side, by a convulsion. For he says, "You will never see, that persons who are convuls'd are drawn to-

“wards any other part, or into any other figures, than the three enumerated “ones;” that is to say, that they are either quite strait, or bent forwards, or backwards; but never to the right side, or to the left.

But did the beginning of the tetanus lie hid under that disorder of the fauces, which preceded it for some days? For thus did Wepffer “sometimes” observe, as you will read in this section of the Sepulchretum (*c*), a disorder beginning “in the upper part of the œsophagus, with some difficulty of “deglutition, which on the third day a manifest tetanus succeeded.” And again, did the quantity of sweat, which was continually discharg’d from this young man, bring that alleviation to his disorder, which render’d his hands and feet in some measure moveable? Bontius, indeed, as you will see in the same section (*d*) of the Sepulchretum, having learn’d by experience among the Indians, where this kind of disease is as much familiar, as it is in other places rare, among other things, recommends such remedies as produce sweat. But this, perhaps, is more useful, when the disorder has succeeded to a rash expofal of the body, when heated, to cold; as in a soldier, of whom he says (*e*), “that he lay on the ground drunk, through the whole night;” and in three others, whom I know of, at Padua, that having expos’d themselves to the cold air, when they were warm with wine, they in like manner became rigid, and in like manner, “within four days,” one only escaping with difficulty, were carried off: as that boy, who, you will see in the same place (*f*), had fallen into a tetanus of most parts of his body, “from a sweat being suddenly suppress’d in a febrile paroxysm,” escap’d by means of a malignant fever that follow’d it. And these two, doubtless, as well as the former, and indeed, in great measure, the young man of whom we treat, made good the prediction of Hippocrates (*g*), although others have prov’d the contrary; which prediction is thus render’d by Cornelius Celsus (*h*): “These disorders “often carry off the patient within the fourth day: but if they have escap’d “this, the disorder is then without danger.” Yet the very learned Van Swieten (*i*), observes, that, in another part of his works, Hippocrates has set longer bounds for the termination of this disorder; and has also shewn, that it does sometimes happen to continue longer, by an accurately written observation upon the tetanus, in confirmation thereof; which is very similar, in some things, to the above history of Valsalva.

4. As to the red spots, with which the skin of the carcase was thickly beset, would you account for them, according to the decisions of Boerhaave (*k*), from “the muscles being too rigid, and excluding the blood,” which for that reason pour’d itself out under the skin, where the cellular coats of the muscles give less resistance? For as to the redness of the lungs, and that more at the posterior part, especially as the blood, even after death, preserv’d its fluidity, it need not much excite our admiration. But by reason of the blood being excluded from the muscles, and stagnating more or less here and there, you will understand that there was a more easy secretion of the watry

(*c*) In addit. obs. 2. & in schol.

(*d*) Obs. 15. in schol.

(*e*) Obs. cad.

(*f*) Obs. 32. in schol.

(*g*) Sect. 5. aph. 6.

(*h*) De Medic. 1. 4. c. 3.

(*i*) Comm. in Boerh. aph. § 712.

(*k*) Prælect. Acad. in Med. Instit. § 732.

parts, which would give rise to that great quantity of sweat, and the extravasation of serum into one or other of the cavities of the body; unless you would rather chuse to suppose, that it was there collected, by reason of the passages through which it ought to have pass'd, being contracted by the convulsion. And if you suspect, that there were no other reasons, for which serum should be also found in the brain, and consequently suppose, that this was the effect, and not the cause, of the tetanus, especially as there was but very little, and that only in one ventricle; I would have you, at the same time observe, that this was falt: which circumstance Valsalva has by no means observ'd, in the serum of the thorax, and pericardium: and likewise that the greater, or at least the extreme force of this convulsion appear'd particularly in one side of the body.

5. A virgin, almost of the same age as the young man whose history I have just given, labouring under an acute fever, was seiz'd with a convulsion about the seventh day, so that being ask'd a question, she laugh'd with the risus sardonicus; and the convulsive motions were so vehement, that she was oblig'd to be tied down in her bed. A delirium accompanied these motions. Yet all these symptoms were quieted an hour before death: which, as the respiration became every day more and more laborious, happen'd on the ninth day. A little serum was observ'd to flow out of the right ear of the body, after death. The cerebrum was, however, altogether sound; nor was any thing else remark'd in the head, except that when the dura mater was torn in some places, by pulling it away from the skull, a few drops of serum burst forth; and that a little blood likewise, diluted with a large quantity of serum, had flow'd out from some very small vessels which were by accident broken through.

In the right cavity of the thorax, the lungs of which adher'd to the sternum, and to the ribs laterally, eight or nine ounces of serum had stagnated. And to the same lobe of the lungs, on the part opposite to the clavicle, a kind of matter had externally grown, of a middle nature betwixt fat and a gelatinous concretion, like that which sometimes swims in the water found in hydropic bodies; so that there might perhaps be some suspicion, that this virgin had before the present disease, labour'd under an affection of the thorax. In each ventricle of the heart was contain'd a single polypous concretion, almost like mucus, but that in the right was larger than that in the left.

6. Although I am willing to allow, that the cause of convulsions so vehement, might entirely escape our most intimate researches; I would not however deny this, that those few drops of serum might be of such a nature, as to irritate the dura mater most violently; and I have shewn, in the former letter (*l*), that all stimuli are to be estimated from their powers and properties, and not from their bulk. Nor indeed is it a romantic supposition, that the serum which is found in the brain of patients of this kind, is of such a nature, that it may irritate; since, that it has been found to be falt, when its properties have been explor'd by the taste, not only the preceding history teaches, but those also that you have in the Sepulchretum confirm (*m*), which

(*l*) n. 11. (*m*) Sect. hac 13. obs. 1.

produce marks "of a salt serum" (*n*), and even "a serum acrid and brackish" (*o*), a salt serum (*p*), a serous humour which bit the tongue very keenly." Add to these also, that which John Saltzmann (*q*) has publish'd, of a young man, who dying "of the most grievous convulsions, had such a remarkable quantity of a serous humour, under the dura mater, more thin than usual, and of such a sharpness," that it could corrode this membrane, and the interior lamina, of the additamentum of the os occipitis, and even the inferior lamina also; and by this means prepare an exit for itself, out of the cavity of the cranium. Wherefore I think it is not at all improbable, that "the lymph" of which Michael Bern. Valentinus (*r*) found a remarkable quantity in the ventricles of the brain of a little boy, "who at length died of horrible convulsions," was also of an acrid and irritating nature; and that the serum was of the same kind, in like manner, which is mention'd by me, in the observation I have given you already, and in the subsequent ones.

7. A girl of five months of age was seiz'd with a fever, and a flux of the belly. The day after her seizure, a fever only remain'd. On the third day, she was attack'd by a violent *clonic* convulsion of the upper limbs: which was also extended to the posterior muscles of the thorax, but slightly; and more slightly still to the glutæi. About the end of the fifth day, the convulsion remitted; but by intervals only; yet by no means discover'd itself when the child slept: however, a jaundice succeeded, in the mean time, through the whole body. The skin of the body, after death, was every where distinguish'd, but especially on the back, with red spots inclin'd to blackness.

In the belly was nothing worthy of remark, except the intestinum rectum, which was ting'd with a black hue: In the thorax, the pericardium was full of water, and that yellow: but the right ventricle of the heart contain'd a polypous concretion, which reach'd to the pulmonary artery, and resembl'd concreted mucus. The remaining part of the blood was altogether fluid: yet, when expos'd to the air, after some time coagulated. Finally, within the cranium all things seem'd to be extremely natural, except that between the dura and pia mater a serous humour was found, which had concreted about the sanguiferous vessels, in the form of a jelly.

8. Did the convulsion remain quiet when the girl was asleep, for this reason; because she slept? or was it rather, that she slept because the convulsion was quiet, which must otherwise have awak'd her when she slept? Doubtless the latter of these opinions is the more probable, and brings back to my mind, the discourse which pass'd, in former years, betwixt me and that very learned physician, and, at the same time, most humane man, Francesco Serao, when he spoke of the utility of vesicatory medicines, as they call them here, even sometimes in convulsions. He related a case of a boy of five years old, who liv'd at Naples, and who had fall'n into epileptic convulsions a year or two before, which recurr'd as often as the boy began to sleep; whence being made stupid, and paralytic in his legs, so that he could no longer walk upon

(*n*) Obs. 3.

(*p*) in Additam. obs. 3.

(*o*) Obs. 4.

(*q*) Act. N. C. Tom. 2. obs. 98.

(*r*) Eph. N. C. Cent. 3. obs. 1.

them,

them; and having us'd innumerable remedies in vain, he was cur'd by a vesicatory medicine alone, being apply'd, as he had order'd, to the posterior extremity of the sagittal suture. For the paroxysms, which were before innumerable, began soon to be fewer, and less violent; and within fifteen days, they entirely left the patient, the power of standing, and walking, at the same time, returning to him. And the same learned gentleman confirm'd, that not only in this case, but at other times, in other patients, vesicatory applications had succeeded well with him against convulsions; so that Hippocrates seem'd to be in the right, when he asserted (s), "that convulsions were brought on either from repletion or inanition:" which two causes, Galen also laid down as the chief, though he sometimes added another (t), which afterwards pleas'd the greater part of the physicians so much, that they rejected the two first; I mean, that which is drawn "from a biting and thin humour gnawing the nervous parts;" that is to say, from irritation, which is, nevertheless, by some learned men in our times, refer'd to the article of repletion. However this is, certainly when convulsions are brought on from repletion, as in this boy, they will not be remov'd, unless that matter is taken away, which by overloading, or distracting the fibres, gave occasion to their attacks. In this manner, nearly, said he.

But as to what concerns the other circumstances, related in the history; did the jaundice make its appearance in the constitution for this reason; because the convulsion had constring'd even the biliary ducts, through which the bile, in order, perhaps, to produce a salutary flux, had already begun to flow? Was the bile's being retain'd in the blood, in the number of those causes, which assisted to preserve its fluidity? For that there were some foreign causes, conspiring thereto, I think may be argu'd from the concretion of the blood, when expos'd to the air, whether from the watry particles, or from others, which kept up an intestine motion, being evaporated. I should also be glad to ascertain, if that blackness of the intestinum rectum was one of the effects of the convulsion; whether the canals of the veins being streighten'd, by delaying the blood only, or by obstructing it so long as to cause a gangrene, had given rise to this deprav'd colour. For as to the red spots in the skin, and the quantity of water in the pericardium, I have spoken sufficiently before (u) on these subjects. Last of all, as to no serum, but a kind of jelly, being found about the meninges; do not understand it in such a manner as if serum had been wanting there, having an eye to what I have before (x) written of the very thin, pellucid, and cellular lamellæ having serum so intercepted between them, that by reason of their interposition, it appear'd in the form of a jelly.

9. A little boy, (born of a valetudinarian mother, who, especially while she was pregnant with this child, having been liable to various and complicated disorders, had frequently, in order to quiet them, us'd, by the advice of the women about her, pretty liberal draughts of generous wine) was first taken with a scald head; after that, being troubl'd with a scabies, when the pustules ceas'd to be moist, he was seiz'd with a fever. But this fever leav-

(t) S. 6. Aph. 39.

(r) Meth. Med. l. 12. in fin.

(u) n. 4.

(x) Epist. 6. n. 12, 13. & epist. 7. n. 11.

ing the child, when the pustules began again to weep a plentiful ichor, the scabies began to rage more grievously, and the infant to grow lean and thin.

At length, after an interval of many days, the pustules being again dried up, he was troubl'd with a diarrhea, and convulsive motions frequently, within the space of eight days; and about the latter end of the eighth month of his life, when his incisor teeth were about to cut through the gums, he died.

All the viscera of the belly were sound, and the magnitude of the liver itself corresponded in proportion with the others. In the thorax, the right lobe of the lungs very closely adher'd to the pleura all round; yet both right and left were altogether uninjur'd, and undistinguish'd by any spots. The heart contain'd no polypous concretion. Between the meninges of the brain, a small quantity of serum stagnated: and the posterior part of the cerebrum itself, being not of a convex figure, seem'd rather to approach to a cubical form.

10. It appears from this history, in the first place, of how much importance it is, that mothers, in the time of their pregnancy, should have good health, nor take too freely of pure wine; and, secondly, that the scald-heads, and scabies of infants, should not be unseasonably dried up. For dentition, as I have before said (y), actually brings on, not only distensions of the nerves, but fluxes of the belly also; which, however, provided they be within bounds, are of use in alleviating the other symptoms: but the former symptoms prevail more than the latter, if at the same time the blood abounds with a quantity of irritating particles, which were wont to be thrown out by another way, as in this case. And that the external figure of the cerebrum, which is us'd to follow the form of the skull, may, when it is not natural, indicate something also in the internal structure, which is, in like manner, entirely foreign to the intention of nature, and which renders it more prone to diseases, does not seem entirely to be denied.

Thus far I have given you the observations of Valsalva; but now I go on to my own, beginning with two that I formerly made in conjunction with him, and committed to writing, which it was hardly possible for him to do, as he was so greatly taken up with avocations.

11. Bartholomew Manzoli, a marquis, and grave senator of Bologna, the same whom Valsalva (z) and I (a) have spoken of, on account of some colours, and other surprising appearances, shying before his eyes, was at the same time afflicted with other symptoms of disease, (which we then touch'd upon but briefly and slightly) in the following manner. He had formerly, when he was in the vigour of his life, expectorated such matter, and at the same time seiz'd with such disorders, that two very learned and eminent physicians, Fabri and Malphigi, believ'd him to be consumptive. He escap'd, however. After that, he was subject to the stone. And when he was become an elderly man, he was attack'd, about six years before death, with a vertigo, and other disorders of that kind, in the head. But within the last year of his life, he was frequently, though slightly, seiz'd both with convulsive and paralytic attacks, join'd with a particular numbness of the whole side, some-

(y) Epist. 6. n. 4. & Epist. in Samonic. I.

(a) Epist. anat. 18. n. 5.

(z) Dissert. Anat. 2. n. 9.

times of the right, and sometimes of the left, but for the most part of the left; which numbness, when it at any time threaten'd a greater evil, was immediately reliev'd by blood being taken away from the opposite arm. He was, also, sometimes troubl'd with a difficulty of breathing. Afterwards, his legs began to swell, and break out into sores, and at length to discharge a watry humour. But for almost a month before his death, the swelling began to decrease; at which time his urine was also diminish'd. There was now a continual difficulty of breathing, and in that difficulty a certain uneasy sensation, the seat of which the patient pointed out, about three fingers above the navel, but internally, whence he also said the disorder began, and was carried, as it were, upwards, as often as an accession of more difficult respiration was impending: yet there was no thirst, no sense of weight, nor any thing else in the thorax, from which the patient should suppose that he had water collected in the cavity thereof; so that he insisted upon it, when the physicians suspected such a thing, that he could not agree with them in their opinion, and chose rather to accuse convulsive disorders of the stomach, to which he had been also sometimes liable. In the mean while, his abdomen grew tumid; and convulsions, with a stammering of speech, came upon him, especially on the last days. Moreover, on the two last days, the stammering was much increas'd, and what he said was generally foreign to the purpose; and hanging down his head, as if he could no longer support it, more violent convulsions, which at length began with a distortion of the mouth, soon carried off this nobleman.

The belly, though it was tumid also in the dead body, and a watry tumour distended the involucre of the subjected colon, nor water was wanting betwixt the integuments of the inguina, yet had itself none, or, at least, very little moisture effus'd: for the intestines being distended with air, had render'd the abdomen protuberating. The liver, both in colour and firmness, was somewhat beyond the bounds of nature; but a little only: and the pelvis of each kidney contain'd granulated and yellowish calculi. Nor was any thing else observ'd in the belly. But the thorax was, on each side, full of the greatest quantity of water imaginable; and in this cavity the lungs were of a purple colour, degenerating into black, yet no-where hard, or bearing any marks of the cicatrix of a past abscess, and scarcely at all adhering to the pleura, except by one very small surface. In the pericardium was a great quantity of serum; and, in that the heart was very lax, and broad, and had, at its right ventricle, a small polypous concretion. Finally, the skull being open'd, there was much water between the meninges, and not a little in the convoluted furrows of the brain, where it seem'd to be somewhat more glutinous. There was also a little quantity at the basis, and some in the ventricles. The plexus choroides were palish; and in them were some tumid vesicles. The brain itself was pretty lax.

12. Those things which were remark'd in the carcase, being seen, and compar'd with the history of the disease, Valsalva was so far from doubting, whether the water had been extravasated in the head, long before it was extravasated in the chest, that he believ'd, it then began at length to be deposited in the last-mention'd cavity, when the former was so full, that it could admit no more; nearly in the same manner, to wit, as in wounds of the

head, that are redundant with a quantity of pus, a part of which is frequently carried to some other part of the body, and frequently to the thorax itself. Be that as it will, this, however, at least, it does not seem possible to deny, that then, particularly, the water was collected in the thorax, when the swelling of the legs falling, and the urine being diminish'd, a continual difficulty of breathing came on : although the convulsions also may seem to have conspir'd therewith, to render this difficulty more grievous ; that sense of the disorder, beginning three fingers breadth above the navel, but internally, and thence ascending to the thorax, perhaps indicating, that the cause of the convulsion was seated in the great plexus of the mesenteric nerves. But the case was differently explain'd by Valsalva, to wit, that the diaphragm being overloaded and irritated by the water, the appendages of it could not but be affected ; for that a like sense of uneasiness had been remark'd by him in a priest, at the very same place ; and yet after death, nothing preternatural was any-where found, except water in the thorax. However this is, certainly both explications refer to the parts which lie on the anterior surface of the lumbar vertebræ, or those that are the nearest to them. And that you may not imagine this situation to be too far back, and suppose it improbable, that the patient should point out the spine, rather than the abdomen itself ; pray call to mind, how far that surface of the vertebra is distant from the extremities of their posterior processes, and how much it is curv'd, and protuberates forwards into the cavity of the belly : so that I have seen the hardness of it more than once impose, not only upon patients themselves, but even upon physicians, who were but little skill'd in anatomy. And this has happen'd particularly in lean and thin people, where they sometimes, with God's leave, would fain have convinc'd me of there being a very remarkable hardness in the mesentery, which I have found by laying my hand upon it, to be nothing more than this anterior surface of the spine whereof we speak. And I remember that, once, having call'd aside a formerly celebrated physician, (as my custom is on such occasions) to admonish him of his mistake, in this affair, he gave me great thanks for my admonitions, and bad adieu to the despisers of anatomy.

13. A man, of more than forty years of age, who was by occupation a hemp-dresser, being of a pallid countenance, but seemingly in good health, began, two years before, to have a swelling at the lower part of the chest, near the cartilago eniformis ; which, though it gave him no trouble, was not, however, agreeable. Wherefore, he applied many remedies, recommended by different persons, but in vain ; for the tumour grew more and more, though gradually : so that it now began to give some little uneasiness in drawing his breath. Fifty days before his death, he was attack'd with a pain in the inferior vertebræ of the thorax, as if from something that prick'd him, and was at the same time a weight upon him ; and this pain sometimes extended itself downwards to the loins, and sometimes upwards to the scapulæ. With these disorders were join'd a lassitude and weakness of the whole body. But eleven days before his death, his lower limb, on the right side, was seiz'd with a numbness, and soon after, before any assistance could be brought, with a palsy ; yet in such a manner, that the power of moving, rather than of feeling, was taken away. Three days after, he could not
make

make water; so that it was necessary to have it drawn off by the hand; which on the first few days, indeed, succeeded very well; but afterwards, either none at all was drawn forth, or if at any time the urine began to flow through the catheter with impetus, it immediately stopp'd, as if something had oppos'd its progress. And, indeed, the extremity of the silver tube seem'd to have been obstructed, by a kind of mucous, and almost purulent humour. Two things were also observ'd, when the catheter was first introduc'd: one, that there was some obstruction near the bladder, which prevented the pipe slipping freely; the other, that the whole abdomen was tumid, and it was uncertain how long a time it had been so. The patient was thirsty; and as he could not lie down now, by reason of the pain in his back, if he attempted it, he breath'd with much greater difficulty: yet his legs, and his feet, were not swell'd. In the midst of these complaints, also, he began to be tortur'd with convulsions of the upper limbs, and with *tonic* convulsions of the trunk itself; which recurr'd at intervals, and continu'd for a quarter of an hour, and at the same time excited both a vomiting of a yellow humour, and threw some little clouds over the understanding, which was at other times very strong and clear. And now the left lower limb, also, was taken with a palsy, in the same manner as the right. Finally, although the day before his death he was so exceedingly bad, that his pulse could no more be perceiv'd, it return'd again, nevertheless, a few hours before death, and the patient seem'd to be a little better, and likely to drag on a while longer. But (what ought to make physicians cautious, especially where convulsions are every now and then returning) he was soon after suddenly taken off by the return of the convulsions.

In the belly we saw much water, and that turbid; and the intestines were, in some places, join'd to one another, by a kind of flaccid membranes. The spleen, which was otherwise sound, had a whiteness externally. The liver was of the same colour, except that, in the middle of its convex surface, a black spot appear'd, in the form of a circle, but not larger than to be cover'd with a farthing; and under this was a cavity, not very deep, which was fill'd with half-coagulated blood. The left kidney, internally, not far from the beginnings of the pelvis, shew'd a little white pus. The bladder contain'd urine, but not in a great quantity: its membranes were become thicken'd, and the internal surface was distinguish'd with vessels, which the stagnating blood had render'd extremely conspicuous. In the urethra we look'd for, and found, that, which lying near the bladder, had somewhat resisted the passage of the catheter; for we found a kind of fleshy fibrillæ, which I remember also to have met with at other times, descending here and there, on the sides of the feminal caruncle, in an oblique course, but parallel to each other, and being there prominent through the internal surface of the urethra. The testes, and the coats that lay round them, and even the scrotum itself, were at that point of inflammation, which verges to gangrene.

The tumour of the lower part of the breast, when I accurately examin'd it with my hand, before it was touch'd with a knife, seem'd to consist entirely of the lower bone of the sternum, and cartilages of the ribs on the right side, which were annex'd to it, being curv'd outwards more than was natural, by some force impelling from within, whatever that force might be.

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Nor did the dissection disprove my supposition; but also shew'd, that the cause of this curvature was not immediately subjected to that bone, and the cartilages, but was even situated far off, in the very spine of the thorax, the figure of which we saw was not natural. But we first met with these things only in the thorax, that were worthy of remark. In the pericardium was a turbid water, and not in small quantity. At all the orifices of the heart were polypous concretions, of a white colour, pretty large in the auricles, and small in the arteries. Throughout the internal surface of the aorta, were sprinkl'd, here and there, small beginnings of ossification, white and somewhat round, not yet hard, but the more thickly sown, as it were, the nearer they approach'd to the heart. The vessels of the diaphragm, even the smallest, were just as conspicuous from the blood stagnating in them, as if they had been fill'd by an anatomical injection.

The upper part of the cranium, and the dura mater which lay under it, being taken away, a few drops of extravasated blood were seen on the pia mater, under the vertex, and near to the left side of the longitudinal sinus: and the vessels which crept through this same membrane, where it invests the right hemisphere of the brain, were very much distended with blood, and of a black colour. In all the windings betwixt the convolutions of the brain, an almost limpid water stagnated. In the ventricles was scarcely any water. But at the great foramen of the occiput, was a large quantity, which made it natural to conclude, that it could not but have flow'd from thence, down into the tube of the spine; from which the water did, in fact, presently flow out, when the spine was cut asunder, at the lower part of the thorax. The marrow was in that place white, and, as far as we could judge by the eyes, found also. This dissection was perform'd about the middle of July, 1705, in the Hospital of Incurables, at Bologna, the celebrated Laurence Bonazoli, my friend, and pupil in dissections, assisting me therein, (as he generally did in most others, which I shall mention as being perform'd there) who at that time being a young man, bore the office of assistant physician there; but afterwards, very deserv'dly, fill'd up the office in that celebrated college, which Valsalva, by dissecting and demonstrating, had before sustain'd.

14. This history relates to many diseases. In the first place, to gibbosity, or incurvation of the spine, which but rarely begins to appear at that age, and which, I suppose, was the reason, why that swelling of the chest had impos'd on so many persons, they not knowing, and even not suspecting, indeed, from whence it had its origin. And that the inflexion of the spine to one side, if it was not then begun, was at least then increas'd, that curvature of the chest, which did not exist before, and was the consequence thereof, sufficiently proves. But whether the beginning, or increase, of such an inflexion, is to be accounted for from a blow, a fall, or a strain, rather than from an internal cause, is uncertain.

The history relates, in the second place, to pain of the back, which must be imputed to that inflexion already greatly increas'd, or perhaps even to the water which had been collected in the tube of the spine, as Wepfer (*b*)

(*b*) Vid. Sepulch. T. 1. f. 15. in schol. ad obs. 3.

judg'd in a similar case. And to this water, doubtless, the palsy of the lower limbs is to be ascrib'd; as also to the palsy affecting the nerves, that go to the muscular coat of the bladder, and those also, perhaps, which are partly distributed to the kidneys, that kind of double ischuria is to be attributed; I mean, first, that of the bladder; and, in the next place, that of the kidneys; for, if the latter of these viscera had gone on to discharge their offices completely, in the last days of the disease, a far greater quantity of water must have been found in the bladder. This case, therefore, relates to those ischuriæ and to the paralysis.

But besides these, it relates also to the ascites; for the production of which, the man's blood could certainly supply sufficient matter, being extremely pale, though, perhaps, not so much from nature, as in consequence of his trade; and how such an occupation may hinder respiration, and consequently the perfection of the blood, is not difficult to conceive: and has even been already shewn, on a preceding occasion (*c*). Last of all, this history relates also to convulsions: and as these carried off the patient, I had rather, for this reason, that the history should be chiefly consider'd in this view.

15. These convulsions were not only external, but internal also, as the vomitings, which were join'd with them, shew'd. But the humour which was discharg'd thereby, was not of such a kind, that it seem'd possible for it to have been the cause of the convulsions, as that "brown" humour, or humour "like the juice of a leek," which Galen (*d*) suppos'd to be the cause of the convulsions, for this reason, because that being thrown up, they entirely ceas'd: with a humour of which kind, "æ ruginous and black," Mercurialis writes, that "the fund of the stomach" was found "entirely fill'd" (*e*) in a young man, a native of Bergamo, who studied at this university, and whom the most violent convulsions had taken off, within twenty-four hours. But in the man, whose history we are now speaking of, it is natural to suppose, that the convulsions took their origin from the water irritating the meninges, both of the spinal marrow, and brain; when, at length, the portion of urine, which was wont to be secreted, began to be retain'd in the blood, and the water was thereby render'd salt. And if all the nerves, which go to the muscles of the lower limbs, had not been altogether resolv'd; it is very probable, that they might, at least, have been affected with some convulsion, if not so much as the upper limbs, and the trunk itself. You have, in the Sepulchretum (*f*), a celebrated history pointed out, from the first book of the Epidemics, in which a woman, who, "at first, began to have a pain in the loins," having that pain extended to the neck and the head, "had her right hand seiz'd with a weakness and "convulsion, after the manner of an apoplexy." Interpreters allow both a paralysis, and a convulsion of the same hand. But Vallesius, as you see in the same place, does not allow of them both at the same time: Duretus (*g*), indeed, at the same time, but the paralysis in the nerve, and the convulsion in the muscle; and Martianus (*h*), in opposition to both, allows them to

(*c*) Epist. 7. n. 14.

(*d*) De loc. aff. l. 5. c. 6.

(*e*) Prælect. ad Hippocr. Aphor. 1. libri 5.

(*f*) Sect. hac 13. in schol. ad obs. 8.

(*g*) In Coac. l. 2. c. 12. n. 9.

(*h*) In Epidem. l. 1. sect. 3. & in Coac. sect. 2. vers. 194.

have existed, both at the same time, and in the same nerve. If I might be allow'd to add any thing after such great men, I think it cannot be deny'd, that both the affections might subsist, at the same time, and in the same part; especially as Marianus produces a clear observation of his own, relating to this question: but, that diseases so dissimilar in themselves, are rather to be imputed to different nerves, than to the same.

And for this reason I said, that if, in the man of whom I speak, these nerves had not been all entirely resolv'd, that is, if some of them, which move any of the muscles of the lower limb, or rather any smaller portions of one muscle, which are incapable, by themselves, of moving the whole limb; if they, therefore, at least, had been unaffected with a paralysis, they might, upon a violent attack of the convulsions, in some measure, have contracted a part of the lower limbs. Certainly the very words of the *Coacc Prænotiones*, which Duretus explains by the example of that woman, seem to Marianus, as well as to Duretus also, not to signify an absolute paralysis, nor indeed to signify any other kind of convulsion, than "slight convulsive motions." But, as in the upper limbs of this man, there was nothing paralytic, that is, as all the nerves lay naked, open, and sensible to the vellicating cause; it is not at all to be wonder'd at, if very grievous convulsions, and such as lasted for a quarter of an hour, that is, *tonic* convulsions, often attack'd him. And as the cause of these, and of *chlonic*, that is to say, of convulsive motions, is the same; they seem to differ in this one thing chiefly, that in the latter the convulsion acts after very short intervals, and, as it were, alternately; but in the former it acts continually: although, I should suppose, that it, perhaps, acts constantly in both; but that acting more mildly in the *chlonic*, it is alternately overcome, either by the natural strength, or weight of the parts: but that in the *tonic*, it acts most vehemently, so that the effects of it, unless any thing else interrupt, shall constantly persist, nor, as it seems, shall sometimes be overcome even by death itself. For what Cæsalpinus lays down is by no means perpetual (*i*), "that the carcases of those who had died of convulsions, were not at all tense, but relax'd" But on the contrary, that sometimes happens which Vesalius (*k*) "remember'd once to have seen," that one side "remain'd convuls'd even after death, in a certain person, who had been wounded in the head;" and, to omit other examples, the celebrated Heister (*l*), while he was about to examine farther, into the carcase of a man, who had died in the hospital at Noremberg of convulsions, after having demonstrated the chirurgical operations upon it, in the theatre at Altorf, found the abdominal muscles, when he was about to examine the body internally, even then "drawn so much inwards," that the linea alba lay almost upon the vertebræ of the loins.

18. But what that can be, which interrupts the action of the present cause, as we said, so that the limbs be not again contracted, till after long intervals, is, for the most part, so obscure, that it leaves room for no conjectures, but those of such a kind, that I said I was entirely averse to. If any thing, however, in regard to the convulsions, is difficult to be explain'd; certainly,

(i) Quæst. Med. l. 2. c. 16.

(k) Chirurg. magn. l. 3. c. 5.

(l) Eph. N. C. Cent. 2. obs. 98. n. 2.

some things are much more difficult of explanation, in a history which, if Valsalva had not left it in his papers, I should not easily believe, nor should give you the description of here. A boy of eight years old, having been long subject, but by intervals, to pains of the belly; at last, upon their return, took *mercurius dulcis*, as it is call'd, prescrib'd by an empiric indeed, but in a proper dose enough: a little after, he became blind of both eyes, the upper, and lower limbs, and the head, were convuls'd on the right side, and remain'd in the convuls'd posture. After a few days, he recover'd the sight of his eyes, and, in a little time also, the motion of his head. Last of all, while he was attempting to walk, the lower limb, which had been convuls'd; was seiz'd with a very great pain; yet, nevertheless, recover'd its natural motion. But then, immediately the upper limb, on the right side, which had, in like manner, been convuls'd before, as I have said, was still much more convuls'd, especially at the flexure of the cubit: yet this convulsion also did immediately remit, and the hand only, at the extremity of the limb, remain'd convuls'd. And now, if any one endeavour'd to extend all the fingers of this hand, then immediately the other healthy hand was seiz'd with convulsions, and was strongly contracted: but, if one finger only was extended, immediately the corresponding finger in the other hand was convuls'd; and the convulsion lasted as long in the one, as the violent extension was continu'd in the other. However, from the time that the boy was taken with convulsions, the pains of his belly return'd no more.

17. A young man of one and twenty years of age, and, by trade, a wool-comber, was seiz'd with a violent fever, to which a delirium also was added, so that it was necessary to tie him down in bed. His delirium having some remission, he was brought into this hospital, where convulsive motions of his upper limbs, and *subfultus tendinum* in both the wrists, were observ'd: in the blood, however, that was taken from him, no inflammatory crust appear'd, but its substance was very dense and compact. A very heavy soporific disorder also came on; so that for the last three days, he lay without speaking a word, and thus died.

As I was to make use of this body, not only to demonstrate to my pupils some things within the cranium, but also within the upper part of the spine, I first open'd the thorax, and finding nothing worthy of remark there, except that one of the lobes of the lungs was observ'd to be very hard, I remov'd these, and all the other viscera, from the parts that were to be examin'd and demonstrated; and while I disjoin'd the fifth vertebra of the thorax from the sixth, much water flow'd out of the tube of the spine. A little also issu'd out from the cranium soon after, when it was saw'd round about. And the upper part of the cranium, and the dura mater which lay under it, being remov'd, we saw the vessels that creep through the pia mater, on the posterior part of the left hemisphere of the brain, to be distended with black blood (such as had flow'd out in great quantity, when the vessels of the neck were divided); and there also we saw, under the same pia mater, in some places, a kind of jelly, as it were, not without bubbles of air being interpos'd with it: notwithstanding, there was not the least bad smell in any part of the body, nor was it the time of the year, being about the middle of March 1745, when a carcase should grow putrid in less than three days. The brain being

dissected, was found to be very hard, and shew'd, up and down in its medullary substance, bloody points, which presently dilated themselves into bloody drops, and were ample proofs of a great quantity of fluid blood. But even in the lateral ventricles, which contain'd scarcely any water, the plexus choroides were of a red colour, degenerating into black. And these ventricles were shorter than usual. This, however, was naturally so: but that which I shall relate to you now, arose from a disorder, partly acute, and of a late date, partly slow, and of a long standing. For it was owing to an acute disorder, that the pineal gland was of a rosy colour; and to a chronic one, that the anterior, and posterior surfaces were not depress'd, as I have been us'd to see them, but rather turgid and full: or at least, if this might happen from an acute disorder, that hardness certainly must have been caus'd by a slow one, which was of such a nature, that, upon perceiving it, I immediately suspected, and, in reality, found, when I cut into the gland, that several small kind of calculi were contain'd in it: among which, one resembl'd a millet seed, both in magnitude and form, but was of the hardness of bone, and, perhaps, of the nature too, as the smell of it, when apply'd to the flame, seem'd to indicate.

Finally; the spinal marrow being accurately inspected, from the cranium down to the fifth thoracic vertebra, I saw all the vessels, that ran upon its pia mater, so very full of blood, especially on the posterior surface, that they seem'd like vessels, which had been immoderately distended, by a red injection. But I also observ'd sanguiferous vessels, in the number of those which attended the spinal nerves, especially some of them, to be very turgid with blood. The abdomen I did not open.

18. That the lobe of the lungs was very hard, does not at all relate to the last disease, in which no symptoms of that viscus being vitiated, were observ'd. But, doubtless, it was either the remains of another disorder, which had been very violent, or the basis and foundation of a future one; which is not at all to be wonder'd at in a wool-comber. For workmen of this kind, are well known to be often affected in their lungs, and often to die, from such diseases; by reason that they take into their trachea, the filthy vapour of the oil, in respiration, with which, not only their wool but themselves are continually besmear'd; and by reason also, that they spend their lives, almost naked, in hot places, and by the side of the burning stoves; from whence they often go out, when they are extremely hot, and at the same time half-naked, into the open air. Neither did the corpuscles, found within the pineal gland, any more than the hardness of the lungs, relate to the last disease, whether they were calculi, or rather in this subject, indeed, of a bony nature, according to the opinion of Scheidius, which I have mention'd before, in another place (*m*). But the rosy colour of the pineal gland seem'd to have arisen from the same cause, which had lately given occasion to the blood's stagnating in the pia mater, and even in the neighbouring plexus choroides, annex'd thereto. And are we to suppose, that this cause was a convulsion, which, by corrugating the pia mater, had streighten'd the blood-vessels here and there, so that the circulation being retarded, the nearest

(*m*) Epist. 5. n. 12.

branches were distended? For you see, that the same thing happen'd about the spinal marrow, on that part, which looks towards the brachial nerves, that were convuls'd: and you even see, also, in the man whose history was given last before this (*n*), that there was the same distension of the vessels, about one of the hemispheres of the brain: which I mention here, lest you should refer this appearance to the delirium alone, which had preceded. But as it is by no means certain, that a convulsion exist'd before the delirium; and as the vessels may be distended with fluid blood, in some certain parts, rather than in others, in consequence of the supine position of a dying, and dead man; I believe it will be better here to suppose, that, which is indicated by the great quantity of blood, flowing out from the vessels of the neck, and by those red points, which appear'd wherever you cut into the white substance of the cerebrum, and presently dilated themselves into bloody drops; I mean, that all the vessels of the brain, whatever had been the cause thereof, were distended with blood. And this blood, while it began to enlarge the ways for itself, here and there, through the very slender vessels, seems to have excited a delirium, by disturbing the motion of the animal spirits, in the nearest medullary fibres; but after it was gather'd together in such a quantity, that by pressing upon and overloading those fibres, it serv'd to constrict them more and more, it seems then to have brought on sleepiness, and at length death. Yet it is certain, that there was at the same time a large quantity of water, especially about the spinal marrow; perhaps, because the blood, by its quantity, had been the occasion of remora to itself; and it was therefore extravasated, from the time that the blood first began to be collected: and in this water nothing forbids us to suspect a power of velleitating the meninges, according to the examples before-mention'd (*o*), less, however, than in the man spoken of before; and what was above hinted (*p*), concerning the manner in which convulsive motions were brought on, leaves us also at liberty to conjecture on that subject.

19. A porter, who was an old man, or at least hoary-headed, was brought into the same hospital, on the first of February, in the same year 1745. He was already without speech, and almost without pulse; but not without convulsive motions. Wherefore he died on the same day. Nor was it possible to learn any thing farther of his disease, because no surgeon or physician had visited him at home, except one, who being call'd to him just before he was brought to the hospital, found him in the same state that I have related.

The body was carried into the theatre, as, except the hands being somewhat tumid, and oedematous, and the upper part of the chest less high on the left than the right side, it seem'd very fit for the purposes of anatomy, which I was then teaching, especially as it was large, muscular, and brawny. These things, however, which I shall recount to you, were more or less preternatural.

In the belly, the liver was somewhat hard, and both internally and externally, was variegated with a whitish, and dirty yellow, colour; and the gall-bladder was full of a bile that was green, but inclining to yellow. The spleen was large and turgid; and the membrane that invested it had, on

(*n*) N. 13.(*o*) N. 6.(*p*) N. 15.

its convex surface, two bony scales, one of which was not very small; but the substance of this viscus, though of its usual colour, was, however, extremely lax, and had almost the consistence of a poultice. One of the kidneys might have been compar'd with the leaf of asarum, in its figure, and that with much more propriety than has frequently been done at other times, by many persons; for it was much more short than the other, more contracted into itself, and incurvated. It had, moreover, not only a small hydarid on the top of it, but even under its proper membrane, at the other extremity, two cavities, not small, and full of moisture, such as I have describ'd in the *Adversaria* (g), and Willis also has describ'd, as you see in this very section of the *Sepulchretum* (r). The bladder, when it was inflated, exhibited a figure, which has, indeed, been observ'd by me (s); but shew'd, at the same time, a smallness much to be wonder'd at in so large a body, if I had not, upon cutting into it, found the parietes very thick, and for that reason not easily to be extended: so that, though the bladder was in other respects sound, I should make no doubt, but the patient had labour'd under some disorders, in which the urine was concern'd; as the relation I have given you seems to prove.

The integuments and muscles being taken from the chest, it was manifest, that the upper part of the sternum was not carried so high on the left side, as on the right; and that the left clavicle was, for that reason, join'd to the sternum lower than the right: so that, for this reason, you would rather believe this formation to have existed from the womb, than that it had been caus'd by his having carried too heavy loads on his left shoulder, when a boy. The lungs, on their posterior surface, were not only red, which is customary with them, but they were also harder than usual; yet so far, as to be the remaining proof of some disorder only, that they had formerly undergone, and certainly not of the last. While I look'd upon the lungs anteriorly, I observ'd an appearance, which I never had seen before. For betwixt the right superior and inferior lobes, a body was interpos'd, an inch and half broad, and three or four inches long, and white, as if it had been compos'd of fat, being intercepted betwixt certain membranes. But, on examining into it more diligently, when I perceiv'd the branches within it, made up of the usual cartilaginous sections of circles, and finally connected to the right bronchia, and even continu'd therefrom; I plainly perceiv'd, that it had been formerly that third little, or middle lobule, of the right lobe of the lungs, which, from some cause or other, being in a manner effete and dead, was so contracted in its substance and its vessels, that it no more resembl'd the lungs, either in colour, in softness, or in structure. Within the pericardium, which was harder than usual, the heart was cover'd with fat; and the valvulæ tricuspidæ, and mitrales, had their lower borders, as I have often seen them at other times, very thick and hard, and a little tuberos here and there, as if their substance had been fill'd with glands. And the semilunar valves were not only here and there hard, but even in some places bony; so that it was less to be wonder'd at afterwards, that on the internal surface of the aorta, both near to the heart, and at a distance from it, to wit, even in the iliaes,

(g) III. *Animad.* 33.(r) 13. *obs.* 1.(s) *Epist. Anat.* 1. n. 61.

white spots sprinkl'd here and there should occur, as the marks of future ossifications. The diaphragm, whichever surface you look'd upon, whether in its situation, or taken out of it, had in every respect the foramen, through which the oesophagus passes to the stomach, much shorter than it is wont to be, insomuch that I never remember to have seen the like. Finally, the cranium, when it was saw'd through, had a little water flowing out from its cavity. Looking upon the cerebrum, I saw the appearance of a jelly, under the pia mater; and the vessels, which creep through the parietes of the lateral ventricles, very turgid with blood. But there was nothing else worthy of observation in the dissection.

20. Passing by other circumstances, which I put down, in order to make the history compleat, although some of the appearances relate to different parts of this work; these last few things remain to be said, which may seem to refer to the cause of convulsive motions. But if you would rather chuse to conjecture differently on the subject, I will not be against it. For he was very weak, and very near death, when these convulsive motions were observ'd. And Boerhaave says(¹), "In the greatest debility, and in an animal who is about to die, spasms and convulsions are wont to precede;" not because the force of the muscles, in contracting themselves, is encreas'd, but because the force of their antagonists is diminish'd, as in a palsy. And there are some who refer to this those prognostics of Hippocrates: "A convulsion from a hæmorrhage is fatal," in aphorism the fifth, number two; "a convulsion from taking too much hellebore is fatal," in the same place, number one. And though the names of these persons have partly slipt my memory, yet you, perhaps, will not be very distant from the truth, if that convulsion, which Hippocrates soon after pronounces "bad (²)," that is, when succeeding either a too great evacuation of blood, or a too great evacuation by the intestines, you, at least sometimes, attribute to so great a want of blood and spirits, that as they are not able to flow into all the muscles equally, these into which they are carried in less quantity give way, while those into which they are carried in greater quantity exceed and overcome; and this, if it continue, gives the idea of a tonic convulsion: yet if the contractions are not permanent, but are by turns, in different muscles, which in that last perturbation of nature, it is easy to imagine, then you have an express image of subfultus, and chlonic convulsion. For that is by no means truly and properly a convulsion, where the muscles contract themselves, by reason of the relaxation, or palsy, of their antagonists; and when they are contracted, can easily, and without pain, be extended by the hands being applied for that purpose. In this man, therefore, if you would have it, that there was a kind of image, or shadow, of convulsive motions, rather than convulsive motions themselves, by reason of his great weakness, I shall not violently controvert your opinion.

21. But that true convulsions, and those which are properly so call'd, may be excited without any intervening palsy, as for instance from punctures, and vellications of the nerves, both in wounded men, and in beasts, but especially in beasts, for the sake of experiment, is extremely well known to every body. And this the pain also confirms, that is join'd with the tonic

(1) Prælect. in Instit. § 401.

(2) Sect. 5, Aph. 3 & 4.

convulsion, at that time particularly, when any one endeavours, as I said before, to extend the contracted limb with his hand, and reduce it to its natural position. And this the method of cure also confirms, which in a palsy would certainly be of the highest prejudice. I remember to have heard from Albertini, of a wicked chymist, who took more pains and labour to prepare the most instantaneous poison, than others do to prepare the most speedy remedies; and if he could have brought this to perfection, he hop'd it would kill by its very vapour. This wicked wretch then having thrown many and various things together into a mattrass, of which it is better not to mention the names (for physicians have imprudently committed many of these things to writing, and some of them in particular, things which I wish could be abolish'd) and having by a length of time, and by much art and toil, chang'd them from a bad to a much worse and more noxious nature; reap'd himself the first fruits of his wickedness. For his vessel having fall'n, in being broken, as it was carried from one place to another, and he being almost distracted at the loss of his time, labour, and expences, was presumptuous enough to take up with a sponge what he could of the liquor that had been spilt, and to press it out into another vessel. No sooner had he done it, but behold he was immediately seiz'd with convulsions so violent, that being hastily carried to bed, he was presently thrown out of the bed, upon the floor, by the violence thereof; and there Albertini, being sent for with speed, found him writhing himself like a serpent, with his eyes almost starting forth from his head, and bellowing in a horrid manner, with his tongue hanging out from his mouth. In this very desperate case, having us'd many remedies, he found nothing of equal advantage with that of bathing him all over in warm oil, by letting him down into a vessel prepar'd for that purpose; for by this means his convulsions were quieted. But Anthony Vallinieri related to me, that when a nobleman had already labour'd with convulsive affections for a whole year, nor any thing else had been of service to him; he had succeeded in the cure, by ordering only, that he should accustom himself to take every night, instead of supper, two ounces of oil of almonds recently express'd. But on so obvious a subject, let it be sufficient to have made mention of these two examples, which I receiv'd from two very celebrated men, one of an acute, and the other of a chronic, disease. Thus far of convulsions. Of the palsy I shall write to you in the next letter. Farewel.

LETTER the ELEVENTH.

On the Palsy.

1. **W**HAT convulsion, of which I wrote in the last letter, is to the epilepsy, the same is palsy, of which I shall write at present, to the apoplexy. For as to the section which succeeds next in the Sepulchretum,

de Stupore, Torpore, Tremore, Horrore, Rigore, Anxietate, doubtless you perceive, that some of these disorders belong to the palsy, some to convulsion, and some should be plac'd under other heads: and this the observations also in that section, when compar'd, demonstrate, inasmuch as, a few of the principal only excepted, some of them are taken from one section, and some from another, as you will see. And indeed that fifteenth section, which is entitled *de Paralyti*, has many in like manner, which are transfer'd from other places. But I, however, shall preserve my custom, and shall bring over again in this place, under the head of palsy, none of the observations which I have already given you, under the head of apoplexy; nor shall I take any from those that relate to blows and wounds, which you will receive hereafter. Wherefore I shall give you only three from Valsalva's papers, and four from mine.

2. An old man of sixty, being troubl'd with a flux of the belly, join'd with gripings, and continual watchings besides, anointed his belly with oil of quinces. And although the flux continu'd quite to the time of his death, yet on the following night, without any previous symptom of his head, he was suddenly seiz'd with an hemiplegia, so that the whole right side of his body remain'd immoveable. On the first day, however, after bleeding, and irritating medicines being applied to the soles of his feet, he could move both his hand and his foot a little; yet the day after could not move them at all. As to the other parts, his right eye was half-shut, his cheeks were red, he scarcely spoke at all, and when he did, he stammer'd; but he answer'd, in such a manner, by nods and signs, to those who ask'd him questions, that you might perceive his internal senses to be strong and perfect. In the beginning of the disorder his respiration was easy; but it became difficult a day or two before his death, which happen'd on the beginning of the fourth day.

While the brain was taken out from the cranium, and especially while the infundibulum was divided from the pituitary gland, a limpid serum, and a fluid blood came forth. On the left, and by the sides of the sanguiferous vessels of the meninges, a little matter was observ'd, which had the appearance of a jelly. And on the same side, in like manner, under the pia mater, the very substance of the brain seem'd to be a little eroded in two places: which was more manifest in the ventricle of the same side. For the corpus striatum was found to be entirely separated from the remainder of the cerebrum, by reason of an erosion, perhaps brought on by serum which stagnated in the ventricles.

3. But whatever was the cause of this separation of the corpus striatum, I have already shewn you in the third letter (*a*), which I sent you, how often a hemiplegia is wont to happen from an injury in one or other of these bodies, or their neighbourhood. Add to this, what the Sepulchretum teaches (*b*), that Willis also having sometimes examin'd the bodies "of those who died "after a long palsy, and a very grievous resolution of the nerves, had al- "ways found these bodies less firm than others in the brain, being disco- "lour'd like lees of oil, and having their striæ greatly obliterated."

(a) n. 18.

(b) Sect. hac 15. obs. 1.

4. Another old man, of the same age, fell down suddenly, at the same time lost the power of moving, and feeling, in the right side of his body. When he was ask'd questions, he scarcely answer'd at all; yet what he did say was with stammering. In all the time that he surviv'd this stroke, he made but little water, and never went to stool without the assistance of glysters. Finally, in the beginning of the 21st day, a difficult respiration coming on, he died. The thorax being open'd, the lungs, but especially the right lobe, were found to have been seiz'd with a phlegmon, in their posterior parts. The ventricles of the heart contain'd small polypous concretions, which extended themselves into the neighb'ring vessels. In sawing through the cranium, the dura mater being wounded, a limpid water flow'd out. The same kind of water was found in the right ventricle of the brain; but in the left, it was ting'd with an æruginous colour, and had form'd an ulcerous cavity in the basis thereof.

5. The corpus striatum, you know, makes up, in great part, the basis of the lateral ventricle. The injury of this part, or those about it, being less, or less acute, than in the former case, might suffer this man to drag on his life a little longer than the other. But did the æruginous water produce that ulcer? or was the water itself produc'd by the ulcer? As it was limpid in the right ventricle, it seems that it must have been ting'd with that colour by the ulcer; which, perhaps, Willis would have thought very favourable to his opinion, inasmuch as he believ'd, that "an extraneous, and, as it were, vitriolic matter, was always" the cause of a paralysis of that kind, which opinion is also mention'd in the Sepulchretum (c). But what I imagine that ulcer to have been, I will point out below (d).

6. An old man of seventy, who had been very voracious in his diet, being seiz'd with an apoplexy long before, and after that with a palsy of the whole right side of the body, was frequently agitated on the other side with convulsions. His senses were also affected; and he sometimes discharg'd calculi with his urine. The abdomen being open'd after death, the omentum was seen to be so far drawn upwards, as to cover the whole anterior part of the stomach. But the left lobe of the liver, which is us'd to lie over a part of the stomach, scarcely touch'd it at all, in consequence of being drawn up by the diaphragm, to which it was firmly attach'd. Moreover, the stomach, although it was corrugated, was, however, when extended, much bigger than it generally is. And the spleen was evidently twice as big as it ought to have been, and of a very dark colour. In the left kidney were found four stones; one of the bigness of a chestnut, the others less. The thorax was not at all open'd. While the brain was taken out of the cranium, some serum, which was contain'd betwixt the dura and pia mater, flow'd out. In the left ventricle, the plexus choroides had in it a body of the bigness of a horse-bean, made up of several hydatids: and under the same ventricle was a sinus, the sides of which consisted of the substance of the cerebrum, that was yellow and flaccid, and seem'd also to be corrupted.

7. This third old-man, as he was more advanc'd in years than the other, and besides, had been more voracious in his appetite, which the size of the

(c) Schol. ad hujus Sect. obs. 2.

(d) N. 8.

stomach confirm'd, was not only seiz'd with a hemiplegia, as others had been, but also with "disorders of the kidneys and apoplexy," which Hippocrates has, on other occasions, number'd among the disorders of old men (*e*); add to these, likewise, that his understanding was impair'd; and finally, that he had convulsive motions in the left part of his body; and these I suppose had their origin from a salt serum; which, as it lay between the meninges, so by irritating both sides of the brain, must have brought on convulsions in the right side, as well as in the left, if this had not been previously paralytic. But you see, also, in this case, that the cause of the paralysis lay under the lateral ventricle, or, in other words, under the corpus striatum, and its neighbourhood. And the reason I have for including the neighbouring parts of this body, I draw from many observations, produc'd in other places; but particularly from that which is given us by Christian Vater (*f*), who, after a palsy of one arm, found a little bone, or a very hard gypseous concretion, in the opposite thalamus of the optic nerve.

8. I do not in the least doubt, but that the same injury of the brain, which I describ'd in this last old man, was, at once, the cause of the long-contin'd hemiplegia, and of the preceding apoplexy, bearing in mind what, from the observations and opinion of Brunnerus, I have already written to you on another occasion (*g*). And I certainly believe, that what Val-salva has there call'd a sinus, the parietes of which were made up of the corrupt substance of the brain, was, in fact, a small cavern, that had been formerly and suddenly produc'd, in the same manner that I have already explain'd to you in another letter (*b*): and which, since then, had, by the help of art, but still more by the help of nature, contracted itself into the form of a sinus. So I imagin'd, that the lesser cavern, full of half-dry'd mucus, which I describ'd as being found, together with a much larger, which was fill'd with blood, in an apoplectic woman (*i*), was to be refer'd to the same class. Nor should I, perhaps, be very far wide of the truth, if I should say, that those two caverns also, were nearly of the same kind, which, when I treated of the epilepsy (*k*), I took notice of, one in a man, and in like manner, one in a woman; in her, less, and full of serum, which was in part black, and had, as it were, some threads floating in it; but, in him, larger, and containing, within unequal parietes, a portion of blood mix'd with the serum: although there, indeed, I chose rather, that they should be comprehended under the general name of imposthume or abscess, as the one might seem to arise from the blow that had been given; and the other, gradually, from the lues venerea: which was, perhaps, the reason, not to say any thing of the situation of either, why, to the other disorders, an apoplexy or palsy of the limbs was not added. And to the same purpose, is the observation we read in Brunnerus (*l*), of a calf, in the substance of whose brain, three hydatids were found, of the bigness of a pigeon's egg, and full of a transparent water; yet, in this animal, no apoplexy had been brought

(*e*) Sect. 3. Aph. 31.

(*i*) Ibid. n. 6.

(*f*) Eph. N. C. Dec. 3. A. 9. & 10. obs. 165.

(*k*) Epist. 9. n. 20, & 23.

(*g*) Epist. 2. n. 16.

(*l*) Sepulchr. l. 1. f. 16. in Addit. schol. ad obs. 12.

(*b*) Epist. 3. n. 3, 8, 9.

on, but a vertigo only. However, although some caverns may be produc'd gradually, and by serum, rather than by blood, it does not therefore follow, that they may not be form'd from the coats of the vessels of the brain being eroded, or ruptur'd. They even may be form'd therefrom, so that the erosion, or rupture, be but slight, and the blood gently exude, rather than break forth with violence, and in a large quantity at once; provided, at the same time, it be also serous, rather than thick: to which the nature of the blood itself, in some bodies, contributes, when it is more watry, less in its quantity, and slower in its motion than usual. But if these caverns are ruptur'd; they may seem, in the bodies after death, to have been nothing else but ulcers, much the same as those which are fill'd up with blood (*m*): and this, I suppose, had happen'd in the second old man, whose history is above describ'd (*n*), by which means the water was ting'd with an æruginous colour. For in the first (*o*), the fluid blood bursting forth, with the limpid serum, indicates that a cavern, which had separated the corpus striatum from the other part of the brain, had been superadded to those which are more gradually form'd, as I have explain'd in the third letter (*p*).

9. And when you shall have consider'd all these things well; I would then have you read that observation of Wepfer's, in the Sepulchretum (*q*), wherein he describes the dissection of a virgin, who died hemiplegic, and gives an account of two caverns, in the right ventricle of the brain; one not yet open'd, of the bigness of a hen's egg; another which, though he had broken into it by accident, as he was opening the ventricle, yet he suppos'd, as far as he could estimate, from the quantity of turbid water that flow'd out therefrom, which was of the same kind, as he also found in the first, that it could "not have been much less" than the other, as he subjoins in the annex'd scholia: he moreover says, "that the corpora striata, and a portion of the corpus callosum at the fundus and sides of the ventricle, had "appear'd unequal, ulcerated, and in a manner lacerated." But if you attend closely to all the circumstances, it will be easy to perceive, that "the "surface which appear'd unequal, and in a manner corroded and ulcerated," was not on the outside of, but within, the ruptur'd cavern. For if the one cavern had been, like the other, whole and entire, and "invested with a "coat peculiar to itself, of the thickness of a crow quill;" or at least, if like the other, it had been "included in a follicle," as he seems to hint, when he calls both the caverns *folliculi*; he would then certainly have describ'd, both the coat, and the situation of this cavern, as well as of the other, nor would have been constrain'd "to conjecture" the bigness thereof, from the quantity of water alone. For which reason I should believe, that this cavern was, properly speaking, invested with no follicle; but that its parietes were made up of the very same substance, which after the rupture of the cavern, appear'd in a manner corroded, and ulcerated.

10. However the doctrine of Valsalva (*r*), which I have before spoken in commendation of, is confirm'd by this observation of Wepfer, as well as by the three foregoing dissections of the old men. For the hemiplegia had been in the left side of the body, whereas the injury, as we have seen, was on the

(*m*) Epist. 3. n. 3.

(*n*) n. 4.

(*q*) Sect. hac 15. obs. 4.

(*o*) n. 2.

(*p*) n. 3. 8. 9.

(*r*) Epist. 3. n. 16. 17.

right side of the brain : and this is what I had never attended to, till I look'd over, very accurately, this section of the Sepulchretum ; nor yet in another observation, inserted in the same place, from John Bauhin (*s*), where the paralysis was found to be in the left side, but the imposthume in the right side of the brain. Yet surely it is not so much to be wonder'd at, that these things should have escap'd me, as that Wepfer, who had observ'd the circumstance once, and again (*t*), should have taken so little notice of it. For he says (*u*), " I do not indeed deny, that those tumours of the right ventricle may, in some measure, have conspir'd to the production of a hemiplegia in the left side ; for I myself, with many others, have observ'd, that one side of the brain being affected, the opposite side of the body had been seiz'd with a palsy : but I believe that the concomitant, and perhaps primary cause, of the hemiplegia, in these cases, was serum ;" without doubt, that with which he thought the small pores of the brain were afterwards obstructed. If he had not said, that he had observ'd it, " with many others," it might perhaps be suspected, that he had observ'd it from a long series of dissections, where it happen'd from an internal cause, as Valsalva has done since him. But now we naturally understand, that Wepfer had seen the same thing that " many others " had seen before him ; I mean, that this contrast betwixt the injury of the brain, and the palsy of the body, had been frequently the consequence of blows and of wounds. Moreover, he does not only attribute but little to these tumours, which had compress'd the right side of the brain so long, and consequently prevented, or at least diminish'd, the influx of animal spirits, into the left part of the spinal marrow, for a long time ; but he even did not think, that there was much more to be attributed to this part of the spinal marrow, which for that reason, perhaps, " seem'd less than the right." His words are, " Nor does it much help forwards the demonstration of this subject, that the left part of the spinal marrow was less than the right ; for if it had been any thing preternatural, the foot must have been incapable of motion equally with the arm ;" as if, in fact, this difference did not frequently occur in persons who are afflicted with a hemiplegia, nor he himself had a little before pointed out the cause of this difference, in a disorder of the axillary nerves, which was very refractory to all remedies ; " which axillary nerves," says he, " are more slender and more tender than the nerves that go down from the os sacrum to the thighs and the feet." For as to his saying, " that the method of cure, which depended on discussing, absorbing, and evacuating the serum," was the method which succeeded ; there is no doubt but it succeeded by drawing downwards, and diverting the serum, by which the tumours had been before, I suppose, much more distended, nature first lending her assistance, by promoting " a very frequent and copious discharge by urine ;" and not by this only, but by other disorders also ; to wit, by the ascites, and by a considerable œdematous tumour, and by a quantity of yellow water being redundant betwixt the meninges, which by diverting the afflux of serum, must prevent the encrease of those tumours that must otherwise have happen'd.

(*s*) 18.(*t*) Vid. Epist. cit. 3. n. 17.(*u*) in Schol. ad cit. obs.

But I would have you consider all I have said in such a light, as to understand, that I do not intend any enmity against Wepfer, whose memory and great merits you are not ignorant that I hold in high esteem; but I say this agreeably to the plan I have laid down to myself, not to conceal any of my conjectures from you, whatever they may be, upon these subjects; and to which I would not have you give more credit, than you please, or shall think they deserve. But having given the histories I promis'd you from Valsalva, let us now proceed to mine.

11. A husbandman, about forty years of age, from his appearance, lay ill in the hospital of St. Mary de Morte at Bologna. He had been first seiz'd with an unfix'd pain in the thorax, attended with a sense of pricking; after that with a paralysis of the tongue, and of his right limbs, so however, that he had still some motion left. At first he seem'd to know his acquaintance, and understand; but soon after, neither the one, nor the other. His pulse was vehement and frequent, but equal. His respiration, except when he drew near to his death, was not bad. His abdomen being open'd after death, exhibited a spleen larger than any I had ever before seen, every thing else in the judgment of the senses being sound; but the lower edge of the liver was a little livid. The thorax, in both of its cavities, had a small quantity of bloody water, and the lungs adher'd to the pleura; on their posterior surfaces, however, though they were red, withinside, and without, they were not hard. In the pericardium was a thick water, but in small quantity, and like, in colour, to that in which fresh meat has been wash'd. The heart itself was flaccid, in the same manner as the rest of the muscles, and in its right auricle, and ventricle, was a large polypous concretion, like a yellowish mucus. But another, which was contain'd in the pulmonary vein, was firmer than this, ascending, as if it were from a kind of basis, from an excrescence to which it was connected, of a cineritious colour, and growing to the substance of the valvulæ mitrales.

While the brain was taken out of the cranium, some water burst forth from between the dura and pia mater, and even from between the pia mater and brain, from which this membrane was, for that reason, easily separated. The smaller trunks of the vessels, which were carried through the upper part of the same membrane, were distended with blood, and the substance of the cerebrum was lax. The lateral ventricles being open'd, and the nates and testes, together with the pineal gland, being laid bare, I found that the gland consisted almost wholly of a yellow and hardish, but almost friable, matter; and that the colour of those four protuberances inclin'd a little to yellow. In the right and left ventricle was a little water, like that which, I have said, was contain'd in the pericardium, except that it was not turbid. And the surface of each ventricle was less smooth than it is wont to be; but in the left was a diseas'd appearance, beside this, which was more obvious to the eye. For not only that medullary tract, which lies between the thalamus nervi optici, and corpus striatum, and was yellow, and in a tender and almost fluid state, but this very body itself, when compar'd with the right, subsided in a very lank and wrinkled state, as if there had been a kind of tabes in its substance: and from the middle of it, a tubercle was prominent, of the bigness and shape of a large bean, but of a red colour, such as you see in
the

the skin from a recent contusion. This being cut into, shew'd nothing peculiar in its substance, except that same redness; whereas the remaining part of the corpus striatum was entirely yellow, and had such a laxity, that it was almost fluid.

12. I shall consider other parts of this history at another time. But at present, I shall consider that part of it, for which the whole history is here chiefly written; and you see, that it does not less confirm the doctrines of Willis and Valsalva, than those which I have describ'd or quoted above; the doctrine of the latter, because the injury in the brain was in the side opposite to that side of the body which was paralytic; and of the former (x), because, in a paralysis which was neither violent, nor of long continuance, the original disorder was not only in the neighbourhood of the corpus striatum, but in the corpus striatum itself, and indeed was of such a nature, that this part was discolour'd, and lax. And these things you may add, to what I have written in the third letter (y), concerning the most grievous injuries happening, for the most part, in the corpus striatum, or its neighbourhood, more than in all the other parts of the brain: and if it is not improper to compare disorders one with another, that are not of the same kind, you may still have more reason to fear, lest it was owing to chance merely, that out of these observations, almost all exhibit the injury of the brain on the right side, since all which are hitherto describ'd in this letter, three from Valsalva's papers, and one from mine, shew it to have exist'd in the left. The observation of Peyronius (z) is very much similar to this of mine, except that, on the other hand, it shews the disorder to have exist'd on the right side of the brain for; almost in the middle of the corpus striatum of a young man, he found a hard tubercle of the thickness of a bean, that is much flatten'd, and this young man had labour'd under a palsy, on the opposite side.

Now, after having read so many examples, describ'd at large, or quoted by me, in this and other letters, of the most grievous disorders being the consequence of injuries in the corpora striata; you will then, so much the more willingly, approve of the conclusion, which the celebrated Langhansius (a) has made, from the observation of disorders similar to these; I mean, that these striated protuberances are the most noble parts of the brain; nor is it to be wonder'd at, since they make up the greatest portion of its crura, and consequently give origin to the trunk of the marrow, that, if they are injur'd, the brain, and the other parts of the body, is affected with disorders, and very often with fatal ones, as I have already shewn.

13. An old man, who, after an apoplexy, was troubl'd with an hemiplegia, in the right side of his body, and who, except his head, which was very well, had not retain'd any power of feeling, or moving, was admitted into the hospital of Incurables at Bologna. There being seiz'd with a fever, and a difficulty of breathing, which was neither attended with a sense of weight, nor any pain in the thorax; and his pulse being very weak, on the last days of his illness, and a gangrene of the penis coming on, he died, in the year 1704.

(x) Vid. supra, n. 3.

(y) n. 18.

(z) Mem. de l'Acad. R. des Sc. A. 1741.
Quatrieme observ.

(a) Diss. de consensu part. corp. hum. § 88.

The abdomen had in it nothing remarkable, beside the intestines being turgid with air. The left cavity of the thorax contain'd water, though but in small quantity; the right had the upper lobe of the lungs of a purple colour, degenerating into black, which was hard, and of a compact substance. In the pericardium was no water at all; and the heart was extremely flaccid, so that I don't remember ever to have seen the like before; for it fell all together, and became so flat, as hardly to be of the thickness of a finger's breadth. And, indeed, all the other muscles were very lax. From the cranium, while it was cut through, a quantity of water flow'd down; and we saw water presently at the basis of the cerebrum, and in the tube of the vertebræ. In the lateral ventricles, also, was a portion thereof contain'd: but a far greater portion, I suppose, had been harbour'd under the pia mater; for this membrane, where it answer'd to the sulci, which are betwixt the convolutions of the brain, was almost white. Besides these things, there was nothing worthy of remark in the cerebrum or cerebellum, except that in the plexus choroides, at least on the left side, there were vesicles turgid with water.

14. I would not have you suppose, that I shall easily determine the cause of the hemiplegia, in this old man, who died of an inflammation of the lungs, to have consisted in those vesicles, which were found turgid, in the part opposite to the paralytic side: for I have often found these appearances even in those who had no paralysis at all. And much less still do I suppose, that it was owing to the water found within the cranium, inasmuch as it did not press the left part of the brain more than the right. And I wonder that some, and, among the rest, Willis, as you see in that fifteenth section of the *Sepulchretum* (*b*), had not attended thereto, (except, by the carelessness of the printer at Geneva, or Lyons, any thing is perhaps omitted); for if he had, he would not have deduc'd the compression of one of the corpora striata rather than the other, or the paralysis of one side rather than the other, from a serous, or bloody illuvies, filling the anterior cavity of the cerebrum. What then was the cause of this hemiplegia? I shall presently, after having added another observation, conjecture (*c*). Nor, indeed, do I think it so difficult a question, as if you should ask me, how it could happen, that, when an old gentleman was at the same time seiz'd with an hemiplegia, and a jaundice (*d*), the jaundice should so "accurately" contain itself within the same right side, which was paralytic, "that even the right side of the "nose was jaundic'd, while the left retain'd its natural colour," notwithstanding the same yellow serum of the blood must necessarily pass through the left side, in the same manner as through the right; unless you can possibly suppose, that being more slowly circulated through the paralytic side, by reason of the laxity of its fibres, it had more time to tinge the parts, as it pass'd through them.

15. A little old woman, who had labour'd under an hemiplegia, for three years, which had succeeded to an apoplexy, though she still retain'd the power of feeling, was, eight days before her death, receiv'd into the same hospital of Incurables at Bologna, after having had a mortification come on in her buttock,

(*b*) Obs. 9. cum. Schol.

(*c*) N. 17.

(*d*) Eph. N. C. cent. 3. obs. 64.

from

from constantly lying upon it, or from some other cause. A few days after her reception, she was seiz'd with a violent pain, first in the paralytic shoulder, and afterwards in the tongue; but these parts, when inspected, shew'd not the least sign of disorder, which could fall under the notice of the senses. An aphonia, or loss of speech, succeeded the pain, which was itself soon succeeded by death; yet she was carried off gradually, and without any encrease of the paralysis. The head and neck only of this woman were dissected. In the neck, I found that disorder of the thyroid gland, which, as it was describ'd on a former occasion (*e*), it is needless to repeat here. There was also, in a small arterial trunk, in the neighbourhood of this gland, a concretion betwixt the coats, consisting of a yellow matter, which had a middle nature, betwixt soft and friable, small indeed, but pressing much inwardly, so as to streighten the cavity of the vessel. Finally, in one of the parotid glands, were little fragments of a kind of tartarous matter, which afterwards contracted the hardness of a bone.

But before I touch'd the head and the neck, while the head was divided from the thorax, those who were present asserted, that so great a quantity of water had burst forth from the canal of the vertebræ, both from above and below, that they did not doubt, but it would have fill'd a common wine-bottle. For this reason, there was little left about the brain, or in its ventricles; besides which, there was nothing worthy of observation.

16. It is not difficult to conceive, that particles of the most acrimonious kind, being carried from the gangrenous parts, into the common channel of the circulation, might have attack'd, not only the nerves of the tongue, but especially some of those of the shoulder, which by reason of their having been at rest three years, were, perhaps, less able to resist the acrimony that had fall'n upon them, and thus have given occasion to those pains which I have mention'd in the history. But we do not for the same reason understand, how so great a quantity of water was collect'd within the tube of the vertebræ, and the cavity of the cranium; and how, when it was collect'd, it brought on aphonia indeed, and death, but not, at the same time, the other genuine symptoms of an apoplexy. Was it because it happen'd to be collect'd in such a quantity by degrees (*f*)? And, indeed, we may with reason suppose, that from the very time of the beginning hemiplegia, there had been much water contain'd in that tube, or in the fistula sacra, as it is call'd. For thus it is often found in hemiplectic patients, as Coiterus has first demonstrated, whose observations you have in the Sepulchretum (*g*); and after him, Wepfer, who, to make the more certain enquiry into this affair, was wont, after all the contents of the cranium were evacuated, to incline it in such a manner, that the water, by reason of the declivity, might have a ready egress from the fistula sacra, by the orifice thereof: which, though it has been generally neglected, by most anatomists, in the dissections of some certain bodies, yet I have not omitted frequently to enquire into, by the same, or at least, some other method, as you might have understood, even from the former letter (*b*). And you may see the observations of Wepfer, not only

(*e*) Epist. Anat. 9. n. 38.

(*f*) Vid. Epist. 4. n. 29.

(*g*) Sect. hac 15. obs. 6. & 7.

(*b*) N. 13.

in this section (*i*), but in the second also (*k*); in some of which he particularly specifies his having seen “much serum,” and “a great quantity of serum,” issue forth from that tube. For as to the case, wherein he saw an ounce of water discharg’d from the orifice, there is no great reason why we should much attend to it, if we must acknowledge, that some quantity of serum is naturally contain’d in the fistula sacra, at its lower part; which seems entirely to have been unknown to him and Coiterus: but how far I am able to decide on this question from my own discoveries, I shall take occasion to shew you hereafter. Nor, indeed, is it difficult to conceive, that by carrying or turning about a carcase, in different ways, as it generally happens, a portion of that natural moisture might pass from the lower part of the tube to the upper: but when it is in a much larger quantity than natural, or has properties different from those of a healthy state, we may then easily understand, how it may injure by these different properties, or by its quantity being greatly encreas’d, and not now lying round, those lower nerves of the cauda equina only, but the trunk of the spinal marrow likewise, which is much tenderer than they; so that by compressing or relaxing it more than usual, a paralysis of the limbs is brought on. But how it happens, that, as it lies in general round about the medullary trunk, it nevertheless presses or relaxes more on the right side than the left, or on the left more than the right, so that a palsy of the right and not of the left, or of the left and not of the right, is brought on, is not intelligible from thence. Wherefore, the same difficulty that occur’d to me, concerning the water in the cranium (*l*), occurs also here in regard to the fistula sacra, unless we can assign some other reasons, beside these, to account for it.

17. And, perhaps, these reasons are to be drawn from the preceding disposition of some part of the brain, or the spinal marrow, whether it be owing to natural formation, or to disease; as for instance, if the inward structure of any of those parts be less firm than that of the others; or if, as in the apoplexy, which I describ’d on a former occasion (*m*), that had its origin from a convulsion of the meninges, one hemisphere of the brain is more constring’d and compress’d, by the more violent convulsion of the meninges, on that side, than the other. And if to a native weakness of that kind, or one that is left by disease, in either side of the body, which of itself, indeed, could scarcely be of any great detriment; I say, if to that, a quantity of water lying round the brain, or spinal marrow, be added, you then doubtless understand, that the firm side of the brain, or spinal marrow, will resist this force, while the more infirm side is not able to withstand it.

18. But as to what I said of the brain, or its appendix, the spinal marrow, being injur’d by the convulsions of its meninges, the same I have also said of the nerves, going from the one or the other of these parts, in a former work (*n*); and I even now the more willingly repeat, as it is the more easy to understand, that not only the pia mater, but the dura mater also, may be contracted all round about the nerves that they cover, more readily than about

(*i*) Obs. 3.

(*k*) Obs. 40. & 47.

(*l*) N. 14.

(*m*) Advers. 6. anim. 84. & Epist. Anat.

13. n. 27.

(*n*) Ibid.

either side of the cerebrum, or spinal marrow. Thus, in a young man (o), who, from worms irritating the intestines, was seiz'd with a palsy of the tongue, which went off, indeed, within a few days, but recurr'd every month, and was attended with tortures of the bowels; I would explain the case from a convulsion being produc'd by a kind of consent, from the intestines to the meninges, which surround the nerves of the tongue, slight indeed, so that the paralysis was soon carried off, but return'd when the convulsion of the bowels return'd. Wherefore, if any nerves whatever, except those of the harder kind, are constring'd, either by the convulsion of their own meninges, or by that of contiguous muscular fibres; or if water, lying round them, press upon, or relax them, when they are not extremely constring'd, and would consequently soon recover their natural condition; the parts to which these nerves go, will be paralytic. And from hence, also, you may have a clue to understand, why in some cases, notwithstanding all the nerves that come from the brain, or spinal marrow, are often equally surrounded with water at the same time, they nevertheless are not all relax'd.

19. And, certainly, an uncommon case, which was seen for about eight days, together, in the same hospital of Incurables at Bologna, ought to be number'd in the class of those, that arise from a compression of the spinal nerves, by their meninges being convuls'd; though in this case they were compress'd only for a certain time, and that not closely. The case was of a virgin, who seem'd to be about forty, and who, after a long-continu'd and obstinate pain of the head, became by degrees paralytic on one side of the body; so that at length she had no use of it at all, either for sense or for motion. While she was thus affected, she was seiz'd also with the same kind of palsy, every day about the evening, on the healthy side, which went entirely off, as the morning came on. And after this disorder had attack'd her, in the same manner, seven or eight times, at the same hour, or at least, not more than one hour sooner or later; then, indeed, an inflammation of the thorax immediately came on, which took off the patient: and the dissection of her body, contrary to my intention, was omitted. But other examples of palsies, from a cause of that kind, are likewise produc'd by me in other places.

20. And examples are, in like manner, pointed out, of those which seem to happen from muscular fibres being convuls'd, about the nerves. Nor, indeed, would I deny, that it may sometimes be explain'd in that manner which is thus describ'd by Boerhaave (p): "The hardness of a convuls'd muscle, if it be too great, destroys the muscles, and leaves it paralytic, as frequently happens after convulsions:" although, where sensation is taken away, at the same time with motion, it is better to accuse the constriction of the nerve, at that time compress'd, so it be not one of the harder nerves, than the destruction of the muscular fabric, as from this constriction alone, both the one and the other may have their origin.

And as to the opinion of Boerhaave (q), "that the palsies of the limbs, where there is no injury in the brain, and which are for that reason cu-

(o) Aët. N. C. tom. 2. obs. 160.

(p) Prælect. in Instit. ad § 401.

(q) Ibid. ad § 282.

“rable, by external medicine;” that these, I say, have “their seat in the “cellular membranes,” with which all the vessels of the nerves are surrounded; this explication also is worthy of its praise, if we use it properly, and without any addition; for otherwise, it seems liable to many difficulties, in the same manner as the others. For if you turn to the *Sepulchretum* (r), or rather to the book itself (s), which is there very negligently copied, you will see what Wepfer observ’d, in hydropic patients, who were entirely unaffected in the sensation, and motion of their viscera, and lower limbs, to wit, “that in the abdomen, the nerves and the nervous plexusses were not “only inundated with a copious serum, but that they were even incrufted “with a kind of jelly, the water being confin’d in a thin membrane, and that “in the feet, which were oedematous; and that from the soles thereof to the “hip, and even to the very loins, the skin, the fat, the membranes, and the “muscles themselves, were wet, and turgid with water, like a sponge:” so that it cannot be doubted, but those cellular webs, with which the vessels of the nerves are surrounded, were themselves also distended with water, and are so in other hydropic patients, whom we see almost every day, without any paralysis being the consequence thereof.

21. But although that which we have in the book, intitled, *De locis in homine* (t), concerning diseases of the nerves; if, however, the question is there of the same nerves, which we speak of at present, to wit, “that the disease, “which has fall’n upon them, rests in the same place, and it is difficult to “draw it from thence;” I say, although this is for the most part true, yet it is less so, when the cause of the disorder consists in their cellular webs, where, as I have said above, Boerhaave found by experience, that they would yield to external remedies. And the disorder even sometimes becomes obedient to external applications sooner than is convenient for the patient; as when limbs that have recently become paralytic, the body not yet being sufficiently prepar’d, are committed to warm baths, or their warm sediments too hastily and rashly; for the serum being, by this means, drawn away from the ignoble parts, easily falls upon the more noble; as for example, the cavity of the cranium, the fistula sacra, the brain, or medulla spinalis, and makes the patient suffer egregiously by the exchange, especially, where there is a previous disposition to an apoplexy, or paraplegia. To which I partly refer the observations of Willis (u), when, from the use of the bath waters, which had been generally so useful to other paralytic patients, he saw some, “who had “their limbs more universally, and more grievously resolv’d, than before.” And to the same effect, certainly, is that passage of T. Livy (x): “Cneius “Cornelius the consul, as he was returning from Mount Albanum, fell “down suddenly, and being stricken in a part of his limbs, went to the “waters of Cumæ; but the disorder growing more violent, he died at Cumæ.” And as to this passage, although I do not remember, that it has been observ’d, by those who have written on the use of the waters of Cumæ, and the neighbouring ones of Baiæ; yet what kind of case is there spoken

(r) Sect. hac 15. Append. ad obs. 5.

(s) Auct. Hist. Apopl. Hist. 13. in Schol.

n. 2.

(t) n. 9.

(u) De Anima Brut. p. 2. c. 9.

(x) Hist. l. 41.

of, is plainly shewn by the manner of speech, which Livy uses on another occasion, as I have before produc'd, by way of example (*y*), and explain'd; I mean that concerning Attalus being all of a sudden silent, and falling down, as he was haranguing: "he fell down-----stricken in a part of his limbs." But let us return to our histories, and even let us come to the very last of them.

22. A woman, who had been before seiz'd with an apoplexy, was attack'd again therewith, and was left stupid and half-paralytic. A month or two after this, she was attack'd with a most violent fever, as the pulse, and the thirst, demonstrated; and of this she died in the hospital of St. Mary de Vita at Bologna. The vessels of the cerebrum were somewhat turgid with black blood; and the cerebrum itself was so lax, that in some places, the cortical substance, join'd together with the pia mater, follow'd the dura, as it was drawn off by the hand. There was a little water in the third ventricle. But the remaining viscera were found. And while we were examining into them, and drawing out a polypous concretion from the left side of the heart, Valsalva coming in by chance, said to us, you will find another on the right side. And in fact, upon cutting into the right auricle, we presently saw one reaching from thence, with its branches, into the vena cava. But the left being not less full of branches, had a more firm trunk, resembling inwardly the substance of a firm compact flesh, which a kind of nervous body surrounded.

23. Concerning polypous concretions, I shall have a more proper opportunity of speaking hereafter (*z*). It is sufficient here, to deduce the stupor of the woman, and the semiparalysis from the great laxity of the cerebrum. For it was impossible, that in this state, it should be able to secrete spirits enough, and dispatch them to the limbs. And as this is sufficiently obvious, it is to no purpose to say much upon the subject; notwithstanding you see, that in order to confirm this, one and the same observation is produc'd twice over, in the Sepulchretum (*a*), with so few between them, that it is less to be wonder'd at, that almost two pages from Willis (*b*), which are copied in the Scholia, to observation the third, should be again copied in the same manner, as a scholium to observation the thirtieth. But of this kind are those passages in particular, in which remedies are applied to the paralytic parts, to remove the cause, in vain. I say to remove the cause. For Valsalva said, that he applied them with a view to preserve, in some measure, the tone of the fibres against a greater laxity: and for the same reason, when he order'd blood to be taken away, from those who had already been long half-paralytic, he order'd at the same time, that wine should be made warm instead of water, and that their hands should be bath'd therein, which it is the custom at that time to do. And this, as you are so desirous of knowing the practice of Valsalva, I was not willing to conceal.

Moreover, there are other causes of a palsy, and these on the outside of the cranium also, against which the use of external remedies is of no advantage. It will be sufficient to mention some select examples of this kind from

(*y*) Epist. 3. n. 17.

(*z*) Epist. 24. n. 26. & seqq.

(*a*) Sect. cit. obs. 8 & 13.

(*b*) c. cit.

Cowper (*c*), and Saltzmann (*d*). Both of these gentlemen found, that a paralysis of the inferior limbs happen'd from causes of this kind; Cowper from an internal tumour, which had so corroded the bodies of two of the vertebræ of the back, that in consequence of their caries, a foramen was form'd, large enough to afford a passage for the finger, quite to the spinal marrow itself; and Saltzmann from the very marrow, not injur'd by a deprav'd humour of that kind, but entirely without moisture, in the superior vertebræ of the loins: and when he says, that in another patient, this disorder had obtain'd "in all the vertebræ of the loins;" it is plain, that not only the marrow which terminates in the uppermost of them, but that a considerable part of the cauda equina, as they call it, must have been affected by the same disorder: I wish, however, that Saltzmann had been more explicit, or more clear, upon this point. But you may collect the symptoms, which would point out, in some measure, the latent seats of this palsy, in the living body, by reading over the observations of both these authors.

24. Finally, lest you should wonder, that a fever, which, according to some of the predictions of Hippocrates, when succeeding to an apoplexy, is a favourable crisis thereto, destroy'd the woman of whom I speak at present; see Martianus (*e*), where he distinguishes the qualities of fevers, and sets the following passage from the *Coacæ Prænotiones*, in opposition to those predictions: "Apoplectic disorders that come on suddenly, and leave a paralysis behind them, if after a time, a fever also be added, are dangerous." And this fever, to omit other things, did not come on till a month or two after the apoplexy. But I have now said enough of the palsy. Farewel.

LETTER the TWELFTH.

Of the Hydrocephalus, and Watry Tumours of the Spine.

1. **A**LTHOUGH hydrocephalus is a single term only, yet it comprehends in itself, as you know very well, many disorders, that differ from each other, both in their situation and effects. And first, that I may give you the whole distinction within the compass of a few words, it signifies a collection of water, between the cranium and its integuments; secondly, within the cavity of the cranium; and that either enlarg'd, as generally happens in foetuses, and children, by the bones of the skull being drawn asunder, or without the bones being drawn asunder, and continuing after the manner, in which we see it in adults: though, indeed, this last kind of disorder is not call'd hydrocephalus, even by all those who call it a dropsey of the brain. That first and external kind of hydrocephalus, although I have seen it in the living body, and especially in a noble infant, whom, in

(*c*) Aët. Lipf. A. 1699. M. Feb. ad Tab. 93.

(*d*) Aët. N. C. T. 2. obs. 102.

(*e*) Annot. in Hippocr. l. 2. de Morb. S. 2. v. 67.

consultation with other physicians, I cur'd without the assistance of the surgical knife; yet it has not happen'd either to Valsalva, or myself, that we have had an opportunity of examining it in the dead body. But the first internal kind of hydrocephalus, at least after the water had been discharg'd, I believe I have seen in those foetusses, whom I have dissected, and found without any brain, as I shall explain hereafter. And as to the other kind, both Valsalva and I have had frequent opportunities of making observations thereon, as several of the former letters shew. None of which, it is my intention to repeat here; but I will rather give you one, for which you will readily see, there was no convenient place in the letters above. And when I shall have produc'd this observation, I will then mention what I have seen belonging, as I suppose, to the first kind of internal hydrocephalus: nor will I be silent upon the subject of the spina bifida, as it is call'd, nor other watry tumours of this noble part.

2. An elderly woman, after having old ulcers of her legs gradually diminish'd, and discharging less and less every day, till at length they appear'd quite dry, was gradually, as it were, consum'd by old age, till she died. The body was brought to this college, when the second course of anatomy, that was given here in the year 1725, was almost at an end. Wherefore, I examin'd, myself, almost all the viscera, and found the liver and spleen to exceed, in some measure, their natural bigness; nor was their substance altogether natural. The ureters also, and the pelvis of both kidneys, were much bigger than usual, which was no obscure indication, that the woman had formerly been subject to the stone, or other disorders of the kidneys; and to this I thought we must refer the smallness of the right kidney, which was less by one half than the left. The left Falloppian tube had coalesc'd, at its extremity, into one substance with its corresponding ovary, having its fimbriae, and the orifice that lies betwixt them, entirely obliterated. The fundus uteri being open'd, an excrescence was seen in the left side of it, which in its size and form, resembl'd half a lupin, its basis only being connected with the uterus, and both its surfaces being quite loose and smooth, and, like the whole internal surface of the uterus, red. The figure of the cranium, and consequently of the brain, was entirely irregular, as I have describ'd in the first letter (*a*); for this is the woman, of whom I made a slight mention, in the latter end of a history, in some measure, similar to this, promising to give the remainder of it elsewhere, which promise I at present perform. The lateral ventricles were very full of turbid water. The plexus choroides were white. In cutting the corpora striata piece-meal, where-ever you directed the knife, you found them consist, almost universally, of the cineritious substance; and, to the astonishment of all who were present, there appear'd no-where any medullary striae, but only medullary points, lying at a distance from each other. The cerebellum, as, in like manner, the medulla oblongata also, was flaccid. Last of all, having observ'd the pituitary gland to be very low, and shrunk in its substance, I carefully extracted it, and first saw that it was without its appendix, as describ'd in the sixth of the *Adversaria* (*b*), and represented in a plate; next, that its body was of a brown

(*a*) N. 14. in fin.(*b*) Anim. 25. & tab. I. fig. 4.

colour, degenerating into yellow; and that, as it was contracted, and lank in its substance, especially as to height, it protuberated upwards much less than it usually does.

3. If any one had accurately remark'd the old and the recent symptoms of disorder under which this woman had labour'd, from the very time that I could learn any thing about her, by enquiring; as I should not have omitted to consider many things here, which I observ'd in the dissection, so I should certainly have refer'd this observation to another place, rather than to this. Which might also have been done with some of those, that are given in this sixteenth section of the *Sepulchretum*, especially with that given under number six, and with the first and second, which are set down in the *Addimenta*, under number seven: and, indeed, the greatest part of observers do not allow the disorder to be a hydrocephalus, where the head is not enlarg'd. Yet there is not the least doubt, but that, when a large quantity of water is, by degrees, collected in the cranium, a tumour of the head must infallibly arise therefrom, if it were possible for the bones to yield to the extension, as they do in young creatures: nor can it be doubted, but some of the causes, which give rise to the congestion of water in the heads of tender infants, are the same that give rise to the congestion in adults; the rupture of hydatids of the plexus choroides, or any other part within the cranium, however, being excepted, of which I shall speak below (c). Suppose, for instance, either such a structure, or constitution, of the pineal gland, that it can transmit no water, as in that Englishman (d), whose ventricles being full of serum, had this gland lying under them, very hard in one part of it, and in the other wasted; or such a quality of the water, that it cannot be transmitted to, or through this gland; the former of which may happen when the water is only limpid; and the latter, when the ventricles are distended with turbid water, such as was observ'd by Brunnerus (e), in the dissection of a princely patient, and by me in the dissection of the woman of whom I now treat. For in this woman, as the ichor which us'd to be discharg'd by the ulcers of the legs, was diverted to the ventricles of the brain, it might, by irritating, and corrugating the extreme tubuli of the infundibulum, obstruct its own passage into the pituitary gland; which for that reason, as all other parts, when they cease from their office of receiving juices, are wont to do, would subside, and become contracted in its substance.

But if thick serum, without any stimulus, or power of irritating, insinuate itself into this gland, and cannot get out, that which will still continue to flow down from the ventricles, will render this receptacle extremely tumid, as Peyronius has seen (f), but must at length preclude all access to the remaining moisture.

Yet in others, causes of a different kind may arise, which may prevent the passage even of thin water through the gland. For that there is, by the very intention of nature, thin and limpid water in the ventricles, but scarce more than is sufficient just to keep their surfaces moist, cannot, I think, be denied. And if Littre (g) did, perhaps, find more in those whelps, whose

(c) N. 6.

(d) *Act. Litsp.* a. 1688. m. Maj.

(e) *Eph. N. C.* cen. 6. obs. 1. in fin.

(f) *Memoir. de l'Acad. R. de Sc.* a. 1741.

(g) *Hist. de la meme Acad.* a. 1711. Obs. Anat. 7.

heads he cut off at one blow, yet they were then sucking; and there is, naturally, in all the cavities of foetuses and animals lately born, more water than in adults: wherefore, it were to be wish'd, that he had made the same experiment in adult animals, which he made in those who suck'd. For it is to be suppos'd, that water abounds then only in adults, when either more than a proper quantity is secreted, or when there is any cause, which intercepts, wholly or in part, the passage of the water to the pituitary gland. And whatever I say of this gland, I would have understood of the other latent passages also, through which I suppose that an exit is prepar'd by nature for the water collected, as I have already (*b*) describ'd to you more at large, and is needless now to repeat.

4. But rather let me add, what then escap'd me, that in this sixteenth section of the Sepulchretum, three histories of one hydrocephalus are produc'd, every one of them from different persons; under number seven by Cummius, under number eight by Paissenius, and last of all, under number five, in the Additamenta, by Pechlinus. All these three gentlemen were present, when the body of that infant was dissected, by Hornius, at Leyden, in the year 1666. As the first two, therefore, publish'd each his own observation, in the first Decuria Ephemer. Nat. Cur. the one in year the first (*i*), and the other in the year the fourth and fifth (*k*); Pechlinus, at length, in the Observat. Phys. Med. (*l*), added his, giving pretty broad hints, that the history was not very accurately deliver'd by the others. For he says, "I will lay "it open more accurately, inasmuch as it is rare, and hitherto not describ'd "in proportion to its worth." And, indeed, there are great differences even in the very weight of the water; whereas Pechlinus, from whom Paissenius differs very little in this point, supposes it to have been a hundred and sixty-three ounces, which Cummius had suppos'd to be "thirty-six." The other differences you will see yourself, by comparing them together, and that in particular which relates most to our present purpose; for Paissenius says, "that the pituitary gland was flaccid, and considerably enlarg'd;" but Cummius, on the contrary, denies, "that any traces of the pituitary gland "appear'd;" and Pechlinus takes no notice at all of the subject: so that it might well be suspected, that each of them meant to describe the dissection of a different hydrocephalus, perform'd in the same year at Leyden, by Hornius, if Pechlinus had not admonish'd us, that an observation of this kind is rare, as indeed it is; and so many other circumstances did not sufficiently demonstrate, that the case was one and the same. Which of the three, then, should we rather give credit to? Brunnerus (*m*), who might have read each of the three descriptions, certainly gave credit to Cummius in this, that "the pituitary gland was entirely deficient;" for he can have no other description in view, than that of Cummius; although there is a mistake in the year, even in the relation (*n*) which is copied in the Sepulchretum: for it is not always to be imputed to the printers, who have made mistakes enough on other occasions, nor yet that very great obscurity of the first observation,

(*b*) Epist. 4. n. 36.

(*i*) Obs. 47.

(*k*) Obs. 196.

(*l*) L. 1. obs. 61.

(*m*) Sect. hac 16. in schol. ad obs. 12. in addit. ad fin.

(*n*) Eph. N. C. dec. 3. a. 1. obs. 152. in schol. ad fin.

in this section; for it is read after the same manner in the *Opusculum* of Bartholin (*o*), whose name, however, ought to have been subjoin'd to the scholia also, which are annex'd to that observation.

But to return to the point; I will believe each, in the circumstances wherein they agree: where they disagree, I will either doubt; or, if a regard is to be had to experience, diligence, and the time in which he wrote, I will believe Pechlinus. And I could wish, that this matter of doubt, concerning the three observations, were insert'd in the *Sepulchretum*. You have, already, what I think, in regard to those two observations, which I pointed out, in the first place, in the *Sepulchretum*, when I wrote to you on another occasion (*p*), concerning the office of the pituitary gland.

5. I will now mention, what I have observ'd in those foetuses, whom I suppose to have been killed, by an internal hydrocephalus. I will mention, I say; for there is no occasion to repeat here, what I have before publish'd: it is sufficient to point it out; and if any thing, perhaps, is to be added, by way of illustration, to add it thereto.

First of all then, I would have you read over again, what is set forth in the *Epistolæ Anatomicae* (*q*), of a foetus that I dissected at Forlì, which had been born without any brain; and I would have you observe this, in particular, that the brain was certainly not originally wanting; but that being extenuated, by the hydrocephalus, and resolv'd into water, it had been carried away, through the foramen, in the upper part of the spine. And though I had not leisure, at that time, as I there confess'd, to look over the greatest part of the observations of this kind, that have been made by others, and to compare them with this explication of mine, which, at that time, I suppos'd to be original, and peculiar to myself; yet, after the publication of the book, having a little more time, I soon began to do it; and was glad to find, from the very first account I lit on, which was that of the celebrated Marcot (*r*), that it had appear'd to him, just in the same light in which it had appear'd to me. And after having remark'd the observations which Wepfer (*s*), and Stalpart (*t*), had formerly collected, and the more modern ones, which the celebrated Brinius (*u*) has mention'd, and others, in order to select those which more immediately belong'd to this question; and, whenever it should be in my power, to compare them; I saw that so many of them were pointed out in other places, by learned men, in books publish'd in the mean time, that I doubted whether I should ever have leisure, I will not say, to examine them all, but even to find them among their authors; with so little care do most of the printers set down the names of the works refer'd to, or mark down the passages their authors quote!

Wherefore, leaving to others to collate these cases, it is sufficient, for me, to have perceiv'd, from the consideration of not a few of them, at least, which it was in my power to collect, that where the brain was really deficient, it might have happen'd from that cause, and be wanting in the same manner, which were just now pointed out. But if you wish to see another example

(*o*) *Consil. Med. de Comet.*

(*p*) *Epist. 4. n. 36.*

(*q*) *XX. n. 56, 57.*

(*r*) *Mem. de l' Acad. R. des Sc. A. 1716.*

(*s*) *Eph. N. C. Dec. 1. A. 3. obs. 129.*

(*t*) *Cent. 1. Rar. obs. 2.*

(*u*) *Inquis. de Spirit. Animal. n. 55. & seqq.*

of mine more fully describ'd, or one of my friends, which has not yet been publish'd, turn to that which Vallisneri (*x*) has mention'd, as his, and mine, and which is describ'd by me in the *Adversaria* (*y*); and let me add this one thing only, to the description, which I very certainly remember, to wit, that there was no part of the cranium, but its basis, in that subject, and even, that this was not entire; for whatever part of it there us'd to be, behind the foramen magnum occipitis, was entirely wanting.

But a few months before I dissected that girl, that is, about the end of the year 1711, when I went, by chance, to Venice, I heard from my friends there, and particularly from him whom I have commended to you on other occasions (*a*), Alexander Bonis, a learned, and diligent physician, that he had been present, not long before, when Santorini himself also dissected a girl, like that describ'd by me (for though these cases do happen in males also, yet I think they happen more frequently in the female sex: and the case I have mention'd to you above, in the body dissected at Forli, was of a female subject (*b*)); and that he saw a child, well nourish'd, and of a very proper size, so as to agree not only with one who died immediately after being born, but with one who was brought into the world at its proper time: and he observ'd, that the upper part of the head only, was extremely depress'd: from which, when the thick membrane was remov'd, that was grown quite firmly to the hairy scalp; he saw no upper part of the cranium, no cerebrum, but only a kind of bladder, in which nothing was contain'd but a yellowish water: and entirely disjoin'd from this bladder, which occupi'd the anterior parts, in the basis of the cranium, and even in the very seat of the medulla oblongata, he saw a small substance, not bigger than the kernel of an almond, which might, perhaps, be in the stead of a cerebellum. You perceive, that in this case, the cerebrum, medulla oblongata, and the greatest part of the cerebellum, were destroy'd by the hydrocephalus, the water of which had not yet universally flow'd out: but in those subjects, which I have spoken of, as dissected by me, the cerebellum was entirely destroy'd, together with the other contain'd parts, and seem'd to have flow'd out with the water.

Nor, indeed, did the illustrious Haller judge that those cases could be otherwise explain'd, not only in other places, but in his *Opuscula Anatomica* (*c*); in which, from his great humanity to me, he was willing to make my name, little as it is, honourable, when he also gave an observation of this kind, on a female foetus, very accurately made, according to his custom, and took notice of many, from others, in consequence of that great erudition, of which he is master; and pointed out the circumstances of such as were most like those already describ'd. He therefore confirms, that the cerebrum was not deficient, in the original formation of his foetus (*d*), by those reasons, which, in the same manner, as the greater part produc'd by the celebrated Laufferus (*e*), may be transferr'd to other foetuses of this

(*x*) Ist. della Generaz. P. 2. c. 17. n. 6.
ad litt. *b*.

(*y*) II. Animad. 35.

(*a*) Epist. 3. n. 17. & Epist. 5. n. 11.

(*b*) Vid. & Epist. 48. n. 49.

(*c*) Opusc. IX.

(*d*) n. 9.

(*e*) Diff. qua infans sine cerebro, &c. § 3.
& seqq.

kind. And that, afterwards, a cause was added, which open'd passages for the cerebrum, to be pour'd out of its containing cavity. And, indeed, you see that these passages were manifest in many; as for instance, a foramen in the foetus at Montpelier (*f*), and mine at Forli; and, in like manner, in another of mine, at Padua (*g*), in which the whole had not yet flow'd out. But in some there was an opening, through which the whole contents had gone forth. So in that of which Gullmann (*h*) speaks, "the occiput was open'd, with a great extension of the pericranium, in which the whole bulk of the brain was included." And other examples, of this kind, you will have from Haller (*i*), whether it be a hernia, if I may so speak, of the pericranium, or dura mater, or rather, of both together, including the brain. And you understand, how easily these membranes being distended; and distracted with such a weight, may be burst asunder at length, and emit their too heavy contents. And if the brain be dissolv'd by the water of the hydrocephalus, the water will not only encrease the weight, but will also render it so fluid, as to give it an opportunity of slipping out gradually, sometimes, even through very small foramina. But as to the manner, in which the water is generated, and how it dissolves the brain; the first is sufficiently spoken of above (*k*), where I mention'd several means, by which the pituitary gland may be obstructed, or other passages, which serve to carry off the water, collected in the brain: and it was also hinted in the same place, that a congestion of water might happen also, from a rupture of hydatids. For that these hydatids have been pretty frequently form'd, not only within the cranium, but within the cerebrum, of beasts, observations, which have been pointed out already by me, from the Sepulchretum, in another place (*l*), sufficiently demonstrate: from reading which, over again, you will perceive, that the same thing has also happen'd to men, sometimes. And that hydatids have often been found, in the meninges of human foetusses, who were born labouring under a hydrocephalus, or without a brain, that case, describ'd by the celebrated Jo. Rud. Zwingerus (*m*), together with that of Montpelier, of Forli, and others, do jointly, and sufficiently, prove.

And you will readily suppose, that the well known observation of Wepfer (*n*), may be refer'd to this class, where the whole bulk was made up of innumerable vesicles, compacted together, full of the most limpid water; unless you chuse rather to be in the number of those, who have supposed, that it related to the substance of the brain itself. And Haller, certainly, when he points out the observation (*o*) of the celebrated Spoerlin, of hydatids being found in the place of the brain, at the same time admonishes us, "that many more examples of this fabric are to be found elsewhere." Vesicles, therefore, of the one, or of the other kind, if from their over-distension, they happen to be ruptur'd, will pour out water within the cranium, in proportion to their number, and magnitude: but those which are generated within the brain itself, as they are driven against its substance, by the

(*f*) Marcot. cit. supra ad n. 5.

(*g*) Epist. ibid. indic. n. 58.

(*h*) Eph. N. C. Cent. 7. obs. 92.

(*i*) Opuſc. cit. not. 3. & 13.

(*k*) n. 3.

(*l*) Epist. 1. n. 6.

(*m*) Act. Helvetic. t. 1. c. 1.

(*n*) Obs. 129. cit. supra ad n. 5.

(*o*) not. cit. 3.

alternate pulsation of the arteries, so Laufferus (*p*) has endeavour'd to compute, how much they can effect, towards the comminution, and dissolution, of the soft medulla of the cerebrum, which lies around them. But by what means soever, and from what source soever, water may be collected preternaturally, within the theca that envelopes the brain; it will be possible for the water, by its interposition, to prevent the growth and concretion of the brain, if it is not yet come to its maturity; or if the brain be already form'd, the water, by insinuating itself betwixt the particles thereof, may, by degrees, disjoin them, more and more, till they are reduc'd to very small dimensions, and thus become easily miscible with water, nor any longer to be distinguish'd therefrom. An instance of which disjunction gradually proceeding, but not being yet perfect, you have given you in a very clear manner, by Christian Vater (*q*), from a new-born infant, that he dissected on the score of a hydrocephalus, where he saw the hemispheres of the brain "expanded
" by the water, and hollow'd out after the manner of a species of cabbage;
" for there were no ventricles, no convolutions, but fibres, whitish, and very
" turgid, with a quantity of serum, distributed from the basis, and trunk
" of the medulla spinalis, through the whole compages of the brain, and
" going in great numbers to the cortical substance, like the lacteal vessels,
" through the mesentery; and in their way they seem'd frequently to com-
" municate and anastomose with each other, in their branches." But in another hydrocephalus; to omit examples of its perfect disjunction, and dissolution here, which I shall mention below (*r*), from Kerckringius, Tombinus, and Laufferus; in another hydrocephalus I say, whom Rombergius (*s*) dissected, in like manner, immediately after its birth, "the water, which was
" like the washings of flesh," will not only show the disjunction to have been then almost perfect, but also the mixture of the disjoin'd particles with the water; besides which, and the dura mater, he could "see nothing distinct
" in this fluid kind of brain." Nor is it to be wonder'd at; for the water, which had already encreas'd to the quantity of four measures, must necessarily act with a great force, as is plainly shown, from its "bursting forth
" with impetus," at the first impression of the knife, and from all the bones which go to make up the superior part of the cranium, being so drawn out,
" that they were distant from each other by a large open space, and could
" be bent here and there in a very easy manner;" whereas, in the former infant, they were only pull'd asunder, as generally happens in this disease.

7. Doubtless the force of the water, gradually collected in a hydrocephalus, especially if the fœtus be tender, is very urgent and manifest, and the more so, in proportion as it begins the sooner to act on the less resisting parts of the cranium. And hence the approach of the bones to each other is not only impeded, but also the very growth of them, sometimes in a few, and sometimes in the greatest part; so that they seem, almost, to be entirely wanting. But moreover, it sometimes happens, that the whole bulk of the tumour does not only press upon the cranium, but also upon the other bones of the body, in such a manner, that the face, and body of the fœtus are

(*p*) Diff. cit. § 34.

(*q*) Eph. N. C. Dec. 3. A. 9. obs. 166.

(*r*) n. 13.

(*s*) Eph. N. C. A. modo cit. obs. 111.

encreas'd rather in a transverse, than a longitudinal direction. An example of which I shall the more willingly subjoin, because, having read over most of the observations on hydrocephali, I do not remember to have met with a parallel instance any where. I have a skeleton by me which was made up forty years ago, or more, so that I do but just remember to have heard, from the person who made a present of it to me, that it was the skeleton of a female foetus, kill'd in the womb of its mother, by a great internal hydrocephalus. And, indeed, the cavity of the cranium is, certainly, now three times as big as that of a child of nine months old; although, when you consider the greatest part of the bones, in the whole body, you will easily perceive, that it was less than seven months old: and when the head is taken away, if you consider its height, you will find that it is scarcely bigger than a foetus of five months. For all the oblong bones of the limbs, in proportion as they are thicker than natural, so in proportion also are they shorter; so that the cause which prevented them growing longitudinally, seems to be the same which had given occasion to their encreasing transversely. But all the ribs, in like manner, are broader, and thicker than usual; and the face, in particular, as much as is taken away from it in length, has so much added to it in breadth. For as the hydrocephalus took away the greatest part of the length, not only by preventing the growth of the two frontal bones, but also by depressing the face in and betwixt the orbits, leaving behind no appearance at all of the nasal bones; so it enlarg'd the face exceedingly in the transverse direction, and that in a very singular manner. For the process of the sphenoidal bone, which that excellent anatomist, Winslow, calls the temporal process, and the squamous portion of the temporal bone, annex'd thereto, were on both sides impell'd outwards and forwards by the water; and the latter was at the same time forc'd downwards, in such a manner, that its processus zygomaticus, which ought to have been horizontal, ascends forwards posteriorly. To this was added a remarkable protuberance, which encreas'd the face transversely, on both sides, made up of the dura mater, joining together the bones, which I spoke of just now, to as many which I shall speak of presently, in such a manner, that no small cavity was thus added to the cavity of the cranium, already too much extended; and that not only in itself, but by the depression of the os ethmoides, and still more by the unusual depression of the os sphenoides, to say nothing of the external bony parietes of the orbits being driven into the very orbits themselves. But now that you may understand what remains, give me leave to say, that the cranium, of which we speak, was made up of two distinct halves of a cranium, the posterior of which was much bigger than the anterior, that we have hitherto consider'd. For after the os occipitis of this anterior half ascends backwards, about a finger's breadth from its great foramen, you there see another foramen, larger than the first, and in like manner, in the middle of the basis, not leading into the tube of the vertebrae, as the former did, but into a bony foramen, like to itself, and continu'd from thence into a bony canal, not longer than the breadth of the tip of my little finger, which before it terminated was shut up with a membrane. From this foramen ascends its os occipitis, longer than in a nine months foetus, but narrower. For the bones of the sinciput occupy, on each side, a part of the space that was due to

this, as they not only begin anteriorly, much sooner than they generally do, but terminate behind much later. Yet to this breadth, the height is by no means answerable; but is even so far unequal, that they not only do not reach to the vertex, but even each of them is so far distant from thence, as to leave at least the space of three fingers breadth between, on each side; for the space that is interpos'd between them both, is fill'd up by the dura mater, which makes up the upper part of the cranium, quite from the occipital bone, even almost to the orbit: and though the dura mater, in that part, is now dried up, yet it is equal to about seven inches in breadth, and is more than nine inches in length. And to the bones of the sinciput, inasmuch as they are common to either cranium, as in the fore-part, in the manner I have said, the temporal process of the sphenoidal bone, and the squamous portion of the temporal bone of the anterior cranium, are on both sides subjected; so, in like manner, these bones on the back part, where they belong to the posterior cranium, are depress'd in such a manner, that being driven outwards and backwards, and being join'd one with another, by a large portion of the dura mater, they give occasion to that remarkable convex protuberance externally, and that corresponding cavity internally, on each side, by which I said that the breadth of the face, and the capacity of the cranium was not a little increas'd. Finally, to each squamous portion of the temporal bone, the petrose portion also corresponds: but although the temple bones happen'd to be larger in the posterior cranium; yet in the two anterior bones only the membrane of the tympanum with its ring appears. Here then you have a description of no common monster; but of a hydrocephalous monster: so that after you have set down as many things as you please, to the account of a monstrous constitution; yet still more circumstances will remain, that you must attribute to the impelling force of the water, such as the obstructed growth of some of the bones of the cranium, the depression of some, the impelling of some to one side, and the drawing asunder of others.

8. But if water, collected by degrees in the hydrocephalus, can have so much effect, even upon the bones of a fœtus; how much more effect will it be able to exert upon the tender, and almost fluid brain! For if in a boy of seven or eight years old, whom Hunauld (*x*) dissected, not only in one of three years, whom Hildanus dissected, as you have it in the Sepulchretum (*u*), the water had so extended the brain, "that the circumvolutions and turns " of it were no more seen," which are at other times so deep in its surface, from whence it may then be enlarg'd, as much as the confinement of the cranium permits; what will it not do, on the brain of a fœtus, in which there are not yet turns, and circumvolutions, of that kind, which can be drawn out, contrary to what Palsenius (*x*) and Pechlinus (*y*) seem to have thought in one whose head "had swell'd immediately from its birth with a " hydrocephalus. And if the thickness of the parietes of the lateral ventricles had been so extenuated in their upper part, and their sides, in a child of five years old, whom Tulpus (*z*) remark'd, not to speak of one of three

(*f*) Mem. de l'Acad. R. des Sc. A. 1740.

(*g*) Sect. hac 16. obs. 16.

(*x*) (*y*) Obs. cit. supra ad n. 4.

(*z*) Sect. cit. obs. 14.

years old, observ'd by Hildanus (*a*), or of two years old, by Vesalius (*b*), by the force of the water, that at the first inspection there seem'd to be none, whereas "it adher'd, like a pretty thick membrane, all round, to the arch'd "circumferences of the dissolv'd bones;" there is no doubt, but the parietes, which are so much more thin and soft in a foetus, may be distended by the water, in such a manner, as finally to be almost altogether, if not entirely, destroy'd: and frequently, indeed, the water may burst forth through these parietes, and through the extended and lax integuments of the cranium and brain, which are join'd into one with them, by opening a way into the uterus, where the parts resist least, or while the foetus is expell'd, through the narrow neck of the uterus, in the birth, carrying with it the fluid, or half-dissolv'd, brain. And as to what I have said of the upper and lateral parietes of the right and left ventricles, the same may happen to the inferior also, and even to the whole medulla oblongata, cerebellum, and medulla spinalis; although with somewhat more difficulty.

And, indeed, the celebrated Pitschelius (*c*), when he gives the relation, how much of the brain was dissolv'd, and of the medulla oblongata also, in a hydrocephalous patient, who had liv'd eighteen months, says not a word of the dissolution of the trunk of this medulla, nor of the cerebellum. Moreover, Vesalius, without doubt, saw the cerebellum, in his patient of two years old (*d*), and the whole basis of the cerebrum, entirely in their natural state; and Hildanus (*e*), in his patient of three years old, in so great an attenuation of the cerebrum, except "the cerebellum, and the other parts in the basis "of the brain." Pechlinus (*f*), also, in that of Hornius of seven months old, found "the cerebellum entirely sound:" yet you will see in his account, that the "root, or basis, of the cerebrum, was already dissolv'd into "fibres;" so that you may perceive, in the more tender creatures, and especially in foetuses, that those parts also in the cerebrum are at length dissolv'd, and wasted away, by the force of the water, which resist most, because in "the formation" thereof, as Steno (*g*) observes, when he speaks of the remarks he had made on a calf which had a hydrocephalus, "they are "already perfect" in their structure and connections, "when the other parts, "for instance, the lateral parts, are still acquiring their encrease."

I however, after so many others, know very well, that in the two foetuses, spoken of above (*b*), the first that I dissected at Padua, and the one I dissected at Forlì, there were no traces either of the cerebrum, cerebellum, or medulla oblongata; and I even found in the second (*i*), that the spinal marrow "was rather a kind of rudiment, as it were," very thin and membranous, than marrow itself. And it has been even observ'd, that this, together with the brain, was entirely wanting, not only in my time, but before. For Wepfer (*k*) mentions, that Fontanus had seen an infant, "who had, instead "of a cerebrum, and spinal marrow, the most limpid water;" and at the same time relates, that "an abortion," of which Maurice Hoffman wrote

(*a*) Obs. cit. 16. (*b*) Ibid. obs. 6.

(*c*) Epist. ad Kulmum de Hydroceph. In-
terno.

(*d*) (*e*) Obs. modo citatis.

(*f*) Obs. cit.

(*g*) Act. Hafn. vol. 1. obs. 131.

(*h*) N. 5, & 6.

(*i*) Vid. Epist. Anat. 20. n. 56.

(*k*) Ad obs. 129. cit. supra ad n. 5.

to Veslingius, as you have it in Velsch, “ was brought forth at Noremburg, “ in the year 1641, without a brain, and spinal marrow,---perforated in the “ neck, so that a finger might be introduc’d into the cavity of the vertebræ “ of the thorax :” and, in like manner, that Hornius, in the year 1665, had dissected a seven-months fœtus, in which there was “ no internal cavity of “ the cranium, but the whole was bony and solid, nor yet any vestiges of a “ cerebrum, or cerebellum ;” and of the spinal marrow, “ not the least part- “ ticle appear’d,” inasmuch as the tube was entirely wanting, and the spine also solid. Finally, he points out the observation of Kerckringius (*l*), under number twenty-three, of a monstrous fœtus, whose “ cranium contain’d no “ brain, nor had any cavity ;” and the spine being bifid above, “ contain’d “ no spinal marrow.” To which observations also Littre (*m*), Fauvel (*n*), Mery (*o*), Suëu (*p*), and perhaps others (*q*), in this age, have added theirs ; the first in a fœtus of eight months, the last in one of six months, and the others in two of nine months ; one of which liv’d two hours, and had some appearance of being sensible, and another one-and-twenty hours, not without taking some little aliment.

Of all these eight observations, I do not see one, except the third, and in part the fourth, that may not be explain’d by a dropsy of the head and the spine ; especially as, in the first, there was even then water in each of the cavities, and in the second a perforation ; such as I saw in that at Forli (*r*), of the spinal tube in the neck. In the fourth, moreover, and the eighth, this same tube was perforated to a much longer tract ; and in the fifth, finally, it was open from the inferior to the superior part.

9. And water may be collected in this tube of the spine, as well by descending from the cavity of the cranium, as by being secreted therein ; so that there may be sometimes a dropsy of both together, sometimes of one only, nor in a different manner in fœtusses, and children, from what it is in adults ; but in the former much more readily, because in them it is found, that the bones of the vertebræ can easily, and do, in fact, yield in the same manner as the bones of the head : wherefore, at one time, some of the vertebræ gaping, and at another time all of them, and water, sometimes in greater, sometimes in lesser quantity, pressing upon the involucra of the spinal marrow, a tumour is form’d on the posterior surface of the spine, of a size proportionable to the quantity of water, and analogous to the hydrocephalus in its nature. But the bones of the vertebræ gape there chiefly, where the future situation of those processes is, which they call spines, not only, as is believ’d, because the bones are there disjoint’d, at that time ; for they are also disjoint’d on the sides, where they are connected with the bodies of the vertebræ ; but moreover, as I suppose, because there is much less resistance about the situation of the spinal processes, than on the sides, from muscles and tendons that lie over it. But as to this tumour occurring “ very “ rarely in the inferior and exterior part of the os sacrum,” as the very ex-

(*l*) Spicileg. Anat.

(*m*) Mem. de l’Acad. R. des Sc. a. 1701.

(*n*) Hist. de la meme, a. 1711. Obs. Anat. 3.

(*o*) & a. 1712. Obs. Anat. 6.

(*p*) & a. 1746. Obs. Anat. 6.

(*q*) Quin vid. etiam Epist. 48, n. 49, & seq.

(*r*) Vid. Epist. Anat. cit. 20. n. 56.

perienç'd Ruysch observes (*s*), wond'ring at the same time (*t*), "that it is "not more frequent in the said part, as it always has an opening in a natural "state;" that happens, I imagine, for this reason, because the tube of the dura mater, containing the cauda equina of the medulla, as it is call'd, with some quantity of water in it, in a natural state, of which I have spoken before (*u*), does not go down quite to that lowest and gaping part of the os sacrum. Yet, sometimes, the force of morbid water urging downwards, the sheath of the dura mater may reach to that part, and being distended outwardly, may make a tumour of the same kind, in that place: wherefore, in that place also, Ruysch (*x*) once saw this disorder, and I know that it was seen, not many years ago, in a certain infant; but Genga, in particular, saw it; and with a very extraordinary success, and such as is not readily to be hop'd for, in these tumours, open'd it, in the case, which that great man, Lancisi, while he was living, describ'd to the celebrated Fantonus, from whom (*y*) I would have you read it, for more than one reason; but particularly for this, that you may understand it to have been a dropsy common to the cranium and spine, and that water had descended from the former into the latter. For when a hydrocephalus had succeeded to a contusion of the head, and a month after, a tumour at the os coccygis had succeeded to the hydrocephalus, I believe, because in a child of four years old, the bones of the vertebræ were less easily relax'd, than the integuments might be, at the opening of the os sacrum, of which I have already spoken; not only from this lower tumour being open'd, and discharging much water for a long time, the head was gradually diminish'd; but when Genga compress'd the hydrocephalus with his hand, which still partly remain'd in the occiput, "immediately," and Lancisi himself saw it, "a palish ichor rush'd forth from the foramen that "was open in the os occygis." Moreover, water seems to have descended from the cranium into the tube of the vertebræ, in other observations also. For in that hydrocephalous infant, whom Mayerus describes (*z*), a turbid and saltish water flow'd out from a tumour of this nature, which was prominent about the middle of the os sacrum, and ruptur'd a little before death: and a probe being pass'd, after death, through the tumour and spine, quite to the brain, a turbid liquor, in like manner, flow'd out. But as the water, which was contain'd in large quantity, between the meninges of the brain, was itself also salt, indeed, yet limpid, I had rather you would attend to that observation, which is join'd by Brunnerus with the twelfth of those, that are inserted in the Additamenta to this section of the Sepulchretum. For a tumour of this kind, being cut out in the back, from the os sacrum, with very ill success, as generally happens, whence more than a pound of the most limpid water flow'd out, "the head of the infant was immediately observ'd "to subside, and to be diminish'd in bulk." But in that twelfth observation, the same seems to be prov'd by a contrary one. For when a tumour of the same kind had been open'd in the back, from whence the most limpid water burst forth, which flow'd out also "six times," on the following days, "to

(*s*) Obs. Anat. Chir. 34.

(*t*) Ibid. obs. 35.

(*u*) Epist. II. n. 16.

(*x*) Obs. cit. 35.

(*y*) In Pacchion. Animad. 6.

(*z*) Eph. N. C. Cent. 1 & 2. obs. 127.

“ the quantity of three ounces every time, as soon as ever,” a cicatrix being induc’d, “ no more serum distill’d therefrom,” the head of the girl began to encrease in its size, and in a short time “ a hydrocephalus, of a vast bulk, “ appear’d.” So in the fourth observation, in the same place, Lecheliuſ, when he deſcribes an infant, born with a tumour of the ſame nature, reaching from the laſt vertebra of the thorax quite to the os coccygis, relates, that on the following days “ the head had, in the mean while, been gradually extended “ into a preternatural bulk ;” ſo as to make it probable, that the water, for which no more room remain’d in the cavity of the ſpine, being now impell’d into the cavity of the cranium, had enlarg’d it after this manner.

When you ſhall have conſider’d what I have hitherto written, and, perhaps, not have diſapprov’d, if you ſhould by chance light upon a paſſage of Hippocrates, which runs after this manner (*a*) : “ Another diſorder ariſes from “ a defluxion of the head, by the veins, upon the ſpinal marrow ; and from “ thence it makes an impetus on the os ſacrum, where the marrow itſelf carries “ down defluxion ;” the ſame thing will, perhaps, come into your mind, as did into the mind of a learned man, who thought, that in theſe words, the diſorder, of which we are ſpeaking, ſeem’d to be deſcrib’d ; and that ſo much the more readily, as you ſhall more readily recollect all thoſe things which I have ſaid, upon this ſubject, juſt before. But, if you read what immediately follows, you will perceive, that the paſſage has no reference, either to this diſorder, or to the diſorders of infants : “ And depoſits it upon “ the acetabulum of the coxendix, or on the joint itſelf ; and if it come to “ matter, and diſcharge, the patient loſes his fleſh, and in this manner waſtes “ away gradually, till he has himſelf no longer any deſire to live ; for im- “ mediately both the ſhoulder-blades pain him, and ſoon after both the feet “ and the legs ; and they at laſt always periſh, after having undergone long “ courſes of applications for their recovery.” For how can it be ſaid, that children deſire either to live, or not to live ? and, to paſs over other things, how does this diſorder ſuffer a long courſe of application for recovery ? Moreover, if any one ſhould imagine, that, in the two laſt deſcrib’d obſervations, the water did not, perhaps, flow down from the cranium into the tube of the ſpine, but that, on the other hand, being originally collected in this tube, after it came to ſuch a quantity, as no longer to be capable of being contain’d within its cavity, even when dilated, it then at length overflow’d upwards into the cranium ; although the appearances, which were obſerv’d in the diſſection of thoſe two infants, do not much favour ſuch a ſuppoſition ; yet I do not, in fact, ſee, that, in ſome other caſes, ſuch a conjecture is to be at all exploded.

10. Neither do all, who have a dropſy of the ſpine, as ſome would willingly believe, labour, at the ſame time, under a dropſy of the head alſo ; at leaſt, Ruſch (*b*), in the obſervations of his, which I mark’d out above, mentions nothing of it ; nor, purpoſely to omit others, Tulpius, whoſe three obſervations of this kind you will read, not in this ſection of the Sepulchretum, but transferr’d into the ſecond (*c*) of the fourth book ; although,

(*a*) L. de Glandulis, n. 10. apud Marinell.

(*c*) Sub obſ. 13. etiam in Schol.

(*b*) Obſ. cit. 34, 35. ut neque 36.

as in an anatomical description of the sound parts, we do not disjoin the spinal marrow from the brain, to which nature has continu'd it, so in treating of the morbid parts, and even of the diseases themselves, the dropsy of the one does not seem to be separable from the dropsy of the other; nor the tumours, which are the consequences of either of these dropsies, are to be plac'd among the other external tumours, more than those which are the consequences of internal aneurisims, when the ribs and integuments of the thorax are driven outwards, and broken asunder. But if, to return to the discourse I had begun, those two tumours, which are describ'd in the same second section, the one under the thirteenth observation, from Caspar Bauhin (*d*), the other in the Additamenta, under observation the fifth, without the author's name being added, belong to the same class with these we treat of; you will not see any mention of a hydrocephalus therein. But you will believe, that both those tumours, which were soft, and like a bladder full of water, and lay in the direction of the lumbar spine, ought to be number'd in this class; and still more, because, as soon as ever a discharge of serum was made from them, convulsions came on, and death was soon after the consequence. For that serum, purulent, foetid, and somewhat tinctur'd with a blood colour, came forth, is by no means to be wonder'd at, when there was a foramen "between the last vertebra, and the last but one, of the loins," which had its origin from erosion, and reach'd quite into the belly; nor that only, for "two of the vertebræ of the loins were entirely wanting, the rest being "sound:" and in those watry tumours, of which we now treat, that the vertebræ are sometimes much consum'd, Jo. Ludovicus Apinus (*e*) informs us; and that the tumours themselves are easily seiz'd with corruption and gangrene, Bidloo also confirms, from an example thereof, which he gives a plate of (*f*). Nor did Jo. David Mauchartus (*g*), and Jo. Henricus Lincinius (*h*), doubt, but the tumours which they describ'd were of that kind; because a purulent ichor, or watry, foetid, and purulent matter, issu'd therefrom. If, therefore, you judge the same with me, concerning those two tumours of which we began to speak, two things will follow: one, that the observation of Bauhin was, perhaps, the first that was made upon tumours of this kind; for that which we read in Forestus (*i*), may, perhaps, even itself, be also the first in its kind, that relates to tumours; not indeed of a dissimilar nature, or less dangerous in themselves, but nevertheless communicating rather with the cranium, than with the spine, such as have been seen in living infants, by me and by Ruysch, as I have mention'd in a former work (*k*): and the other is, what I have already advanc'd, that we must not always expect a hydrocephalus to exist in the same patient, in whom there is a hydrorachitis; and when I read over again this letter, I was very glad to see, that the learned and celebrated Trew thought just in the same manner of these things as I did (*l*). Add to this, that the water of which I have

(*d*) § 1.

(*e*) Eph. N. C. Dec. 3. a. 9. obs. 180.

(*f*) Dec. 2. Exerc. Anat. Chir. 7.

(*g*) Eph. N. C. Cent. 9. obs. 38.

(*h*) Añ. N. C. tom. 1. obs. 74.

(*i*) L. 3. Obs. Chir. 7.

(*k*) Epist. Anat. 20. n. 57.

(*l*) Commenc. Litter. a. 1741. hebd. 21. n. 1.

also spoken above (*m*), that is secreted within the lower part of the cavity, form'd by the dura mater of the spinal marrow, may of itself, if it exceed its natural bounds, be also the occasion of a hydrorachitis. But take care how you confound this water, which is a little viscid, as some do, with that viscous humour, as the ancients, who are pointed out by me (*n*), call'd it, with which the vertebræ are internally smear'd over: for that is neither water, nor does it adhere anywhere to the interior part of the dura meninx; nor, indeed, does it adhere only at the lower part, as this which I see is also acknowledg'd to be natural, by the celebrated Huberus (*o*), and even, indeed, as he himself delivers it, "by the good Malpighi in *Posth.* p. 39, "and with him by Bellini, in the *lemmata* premis'd to his *Opuscula*, who "nevertheless took it for the nervous fluid; an error, certainly, which it "would be almost ridiculous to disprove." But whether they spoke of the same water that we do, you yourself will see; and, in like manner (*p*), whether, in fact, "you can find no observation, to prove a defect of the spinal "marrow, when the cerebrum, or cerebellum, were present." For to me it seems, from two observations of Carolus Raygerus (*q*), which I have well consider'd, that the cerebrum, indeed, was very much alter'd from its natural state, but not destroy'd; whereas, in both one and the other, "was "no spinal marrow, or at least, nothing in the tube of the vertebræ, but "concreted blood, or something similar thereto."

11. But whether the water, with which these spinal tumours are distended, be from that source, which I just now pointed out; or whether it flow down from the cranium, or be deriv'd from both sources at the same time; both one, and the other, of these origins are so probable, that, in general, it ought not to be accounted for from any other cause. For, however sufferable, in former times, the error of those might be, who thought that into a tumour, such as Bauhin describ'd (*r*), "a portion of the urine was carried "from the bladder;" who can now bear it, after the nature of the disorder has been more and more known? Yet that surgeon, whom the learned Platner deservedly censur'd, made a more horrid blunder than this (*s*), when he suppos'd that the urinary bladder was concern'd therein, which "had "happen'd, in that infant, to be either double, or more capacious than "common:" which blunder I should not have touch'd upon, if I had not known, that the same opinion had been entertain'd, not many years ago, by another surgeon, of some reputation, in Italy; so that now, for the third time, the fluid, which has been discharg'd from these tumours, has been suppos'd to be urine (*t*). With more wisdom, but with less necessity, did a man, of great name, deduce this water "from a dropsy of the interior cor-" "tex of the spinal marrow;" which cortex, "while it swells, divides the "spinal marrow, and its theca, from each other." It is to be suppos'd, that he follow'd the tradition of those, who (*u*), "in this disorder, would "have it, that the vertebræ were so bifurcated, as if they had been uni-

(*m*) n. 9. (*n*) II. Anim. 23. & 29.

(*o*) De Med. Spinal. n. 6.

(*p*) Ibid. n. 4.

(*q*) 280. in Eph. N. C. Dec. 1. A. 3. &

64. A. 8.

(*r*) Obs. 13. num. superiore cit.

(*s*) Progr. M. Nov. A. 1754.

(*t*) Huc adde & quarto ex n. 16. infra.

(*u*) Apud Ruysch. obs. Anat. Chir. 34.

“ verſally divided into two parts, in the manner made uſe of by butchers,” and even the ſpinal marrow itſelf; eſpecially, as he quotes Tulpus, who (x) ſays, “ that this diſorder’d ſpine was ſeparated, into two equal parts, from “ the laſt vertebra of the thorax, even to the ſides of the os innominatum, “ this wide opening being cover’d by the peritonæum.” Which paſſage I quoted for this reaſon, becauſe, in the Sepulchretum, where I told you (y), that theſe obſervations of Tulpus were related, you might ſeek for it in vain; and ſtill more, the figures, in which he has delineated thoſe vertebrae (z). For the figures, which are publiſh’d by the authors themſelves, together with their obſervations, although they are often uſeful, and ſometimes neceſſary, in order to underſtand the deſcriptions entirely, are, however, never given in the Sepulchretum, where they might, or even where they ought to, have been given. Without doubt, Tulpus was among the firſt, who illuſtrated this diſorder; but when he was making diligent reſearches, he ſeems to have lit on a more rare circumſtance, if he be compar’d with others, and eſpecially with Ruysch (a), who ſaw it much more often: for he expreſsly ſays, that he had never ſeen it in this manner; and, for that reaſon, ſubjoins another figure (b), in which he repreſents the vertebrae drawn aſunder, only on the back part, as he had found it, and not on the fore part: the bodies of which, Theodore Zwinger (c) ſaw divided, by a deep ſulcus, but although in a monſtrous foetus, having a poſterior ſituation, nor without the ſpinal marrow being whole.

But as to the diviſion of the marrow itſelf; I have, indeed, read the obſervation of Brunnerus (d), which ſeems to favour the opinion of a dropſy, in its cortical medullium. For the “ ſpinal marrow” was found “ perforated in the medullium, and fill’d with water,” the ſinus, or perforation, tending that way, where the vertebrae were open’d; and there had been a watry tumour in the back, before the hydrocephalus. Yet I do not remember to have read, that the marrow ever became bipartite, by the force of the water. For as to the other tumour, of that kind, to which the ſame author (e) ſaw many nerves tending, from the ſpine, and many blood-veſſels, likewiſe, going to it, which emerg’d from the ſame place, ſo that “ the “ membrane, which, at other times, involves the ſpinal marrow beneath, “ appear’d empty, ſo far, as that even all the ſpinal marrow ſeem’d to have “ ſeceded from this ſheath, and to be terminated in the ſaid tumour;” take care how you imagine, that the marrow was divided into ſo many nerviform parts, by the force of the water. For this tumour was “ in the back, upon the os ſacrum;” that is, in the courſe of the lumbar ſpine, in which nature itſelf has divided the marrow into the cauda equina, or, in other words, into ſo many nerves; and it is not at all to be wonder’d at, that theſe nerves, together with the ſanguiferous veſſels, were compell’d into the tumour, by the water, in that place, where there was leſs reſiſtance. In the ſame direction were the tumours deſcrib’d by Tulpus (f), by Lecheſius (g), and by Apinus (h). The firſt, therefore, ſaw, in thoſe three infants, “ the nerves

(x) Obſ. Med. 1. 3. c. 30.

(y) num. ſuperiore.

(a) Obſ. cit. 34.

(c) Eph. N. C. Cent. 7. obſ. 29.

(z) Tab. XI.

(b) Fig. 37.

(d) 12. in Addit. ad Sect. hanc Sepulchr. 16.

(e) Ibid.

(f) (g) (h) Obſ. citatis hoc n. & 9. & 10.

“ of the spinal marrow, dispers’d here and there, through the tumour; “ and carried out of their course:” the other, upon opening the tumour, “ found nothing of the spinal marrow, if you except some white, and very “ slender, filaments;” which he himself thought to be “ rather the ruins of “ the membrane, which invested the spinal marrow, than of the nerves:” the third, finally, “ saw the spinal marrow itself, coming forth from the “ cavity of the second lumbar vertebra, which was yet found, and inserted, “ at least one half of it, into the middle vertex of the tumour.” But as the marrow, certainly, according to nature, cannot come out from that vertebra, inasmuch as the whole of it is already divided into nerves; I confess, that I hesitated upon this observation of Apinus; as I did also upon another of Schraderus (*i*), (not to speak of that of Brunnerus, which is pointed out above (*k*)), though from quite a contrary cause. For Schraderus, in a tumour of that kind, and in the same situation, thought it was worthy of observation, that the marrow, which was hitherto found, when it came to the opening of the vertebra, there “ became evanid, and left nothing behind “ it, but membranous involucri; in such a manner, however, that the be- “ ginnings of the nerves emerging from thence, offer’d themselves, on each “ side, here and there, but in regular order.” Yet the state of the parts seems to have been quite natural. For the trunk of the marrow, as I said, does not descend beyond the second vertebra of the loins; but the nerves, having already taken their origin from thence, go down, regularly, on each side. However, as he says, that the tumour was “ about the beginning of “ the lumbar vertebrae;” it may be, possibly, that the lower part of the marrow was either dissolv’d, or drawn upwards. But in the infant, observ’d by Apinus, the matter was quite otherwise, as the marrow not only descended below the second vertebra of the loins, but was turn’d outwards, and was inserted into the middle, and internal surface, of the tumour, which was seated “ in the region of the last lumbar vertebrae;” as you will plainly conceive from the figures, which are much more clearly exhibited in that dissertation of Charles Frederic Hoechstetter (*l*), in which this very history of his præceptor Apinus is explain’d. While I was wond’ring at this circumstance, I happen’d to light upon the observation of Mauchartus (*m*), which describes a tumour in the inferior part of the loins; that is, from an aperture of the two lowest of these vertebrae, and “ in the middle of this “ tumour, the spinal marrow prominent into a membrane,” which was the inner one of the tumour, lying under the dura mater, “ extending itself all “ round, by the most slender fibrillæ, and entirely terminating.” Finally, when I lately read over, what was found by the very ingenious Trew (*n*), in a tumour, which answer’d to the hiatus, of the three inferior lumbar vertebrae, and all of the os sacrum; and when I first examin’d the figures which were added (*o*), and compar’d them one with another, I believ’d, indeed, from the form, which was at first round, then ending, as it were, gradually in a point, that the little white body, mark’d *c*, *d*, *e*, was the extreme part

(*i*) Dec. 2. obs. Anat. Med. 2.

(*k*) n. 9. primo loco.

(*l*) De Spina Bistida.

(*m*) Cit. supra ad n. 10.

(*n*) Commerce. ibid. cit. hebdom. 20. & 21.

(*o*) Tab. 1. fig. 11. & 12.

of the marrow, going down below all the lumbar vertebræ, within the os sacrum. And indeed, the author saw evidently, that this body “coher’d, by many distinct and scatter’d fibres, with the subjacent parts; and that it was nothing else, but the extremity of the spinal marrow, which constitutes that part call’d the cauda equina, produc’d here a little on the outside of its canal;” that is, carried within the tumour, under whose transparent surface it was seen. Nevertheless, as he afterwards writes, that it was “a part of a peculiar conformation, and coher’d, particularly, with the extremity of the spinal marrow, and the shoots, or branches, that go from it: and that the extremity of the marrow was here stretch’d out quite to the third vertebra of the loins, and presently ended in that little part *c, d, e*, and gave out its nervous branches, or shoots;” and as he likewise affirms, that in the cavity of a similar tumour, were found only filaments of a spinal marrow, interwoven with the sanguiferous vessels, his observation also bearing witness thereto;” I was much in doubt, whether I sufficiently understood his meaning, and whether the nerves only of the cauda equina, forc’d by the water, at their upper part, into one body as it were, were here intended to be describ’d; but by those, whose names I mention’d a little before, I doubted, whether they were not, perhaps, taken for the trunk of the marrow itself, since they are silent in regard to the body of it, which they saw, and which was naturally internal; or whether, which I should rather believe (*p*), they saw the marrow itself, without any deception.

There is a passage of Ruysch, which, without doubt, is worthy of interpretation; where, speaking of this kind of tumours (*q*), he says, “Below that tumour, I find the spinal marrow often sound, and in good condition.” If you understand this of the tumour in the loins, and suppose, that he saw the same, which I would wish others to have seen; you must conjecture, that not *infra* “below,” but *intra eum tumorem*, “within that tumour,” was written by the author. But as he had, a little before, said, that tumours of this kind occur’d “often, in the back, or the loins;” it will be better, perhaps, to understand it of the tumour of the back, beneath which he might see the marrow, and in a good condition also. For thus he certainly saw (*r*), “in the lower vertebræ of the thorax, a very small and sound portion of the spinal marrow; and in the cavity of the vertebræ of the loins, the nerves also sound and natural;” whereas, not only all the vertebræ of the neck, but also as many of the nearest thoracic; as the figures of Kerckringius (*s*), which he points out, demonstrate; “being bifid, on their posterior parts, and without any portion of spinal marrow,” shew’d that the fœtus had labour’d under this kind of disease, both in the neck and the back, at the same time. And hence you have the method of interpreting the passage, I have quoted from Ruysch, as many are doubtful about the sense thereof; and by the way, I do not doubt, but he had seen tumours of that kind, in the back of other subjects also, (not to speak of Apinus (*t*)); and you see, at the same time, how, by joining together, the descriptions of him, and Kerckringius, in regard to the same fœtus, and by amending, and illustrat-

(*p*) Vid. n. 16. *infra*.

(*q*) Obs. 34. cit. *supra* ad n. 9.

(*r*) Theat. Anat. 8. n. 1.

(*s*) Spicileg. Anat. Tab. 9.

(*t*) Apud Hoechstetterum n. 9. Diff. cit. ad n. *super*.

ing one, from the other, where there is occasion, you may make one finish'd and compleat description.

12. But if the spinal marrow, as I just now suppos'd, or at least, its nerves and vessels, (in the same manner as the cerebrum in the hydrocephalus of the celebrated Walther (*u*), and others, and part of the cerebellum in the hydrocephalus of Lechelius (*x*)) are compell'd, outwards, into the tumour; you will enquire of me, in what manner you must, therefore, understand, that which is hinted by very learned men, that this affection of the spine may be also attributed to water, stagnating in the cells, which surround the dura mater, in great numbers, externally, and contain that fat in their natural state, which I said was call'd by the ancients "a viscous humour" (*y*); so that this disorder is very much like the dropsy of the peritonæum. For the dropsy of the peritonæum, you will say, urges the viscera, which it surrounds, inwards; and does not thrust them outwards; nor are those cells on the anterior part, but chiefly on the posterior part, of the canal of the vertebræ; so that if they swell, they cannot drive the cauda equina outwards. But do not imagine, however, that there may not, sometimes, be room for this origin of waters and tumours. For very rarely indeed, but sometimes, nevertheless, tumours of that kind being punctur'd, and the water being drawn out, health has been restor'd; as in that infant, whom Jo. Maurice Hoffman describes, and gives a drawing of (*z*). In which case, if you deduce the water of the tumour, from the cells that smear over the internal surface of the dura mater, being distracted in the birth, which, from the complicated form of the body of the foetus, when in the passage, and from the immense strainings of the rustic mother, was very difficult; you will seem to say probable things: for nothing could be distracted, and injur'd so much, in that position of the child, as the posterior part of the spine, where it lies in the loins; wherefore, the other parts being sound, the tumour, which at first did not exist, began to arise after an interval of a few days, from that part of the spine only.

There were some, even, who thought that the tumour on the os coccygis, cur'd by Genga, which I have already spoken of above (*a*), was caus'd by a humour, which had made a passage for itself thither, from the cavity of the cranium, by means of sinusses, even betwixt the bones and dura mater. But they who have consider'd with Fantonus (*b*), the difficulty of the circumstance, from anatomical disquisitions, and moreover have observ'd, that speedy exit of the serum, from the tumour, as soon as ever the occiput was compress'd with the hand, would not chuse rather to assign any passage to the fluid, than that which nature herself has prepar'd for it, betwixt the meninges; attributing the cure, in great measure, to the age of the child, which was four years, and also to the difference of the disorder, the cause of which was in this case, not internal, but external. For an internal, and especially a congenial cause, not only injures the parts long, but more intimately, both solid and fluid, and the more grievously, the softer they are, and not, as in

(*a*) Partus Monstr. Descript.

(*x*) Obf. cit. supra n. 9.

(*y*) n. 10.

(*z*) Eph. N. C. Dec. 2. A. 6. obf. 208.

(*a*) n. 9.

(*b*) Animad. ibid. cit.

an age somewhat advanc'd, more firm. To this may be added, that the cauda equina of the medulla does not reach to the os coccygis; which was perhaps the reason, why Ruyſch (*c*), "among all," or at least, if you read his next observation (*d*), nearly amongst all, that were affected with these kinds of tumours, "saw no infant who surviv'd the disorder so long," as that which had the tumour upon the os coccygis. For in this case, it does not happen, that so many nerves are infected outwardly, thrust out, hurt, and broken: from the injury whereof arises a weakness, and palsy of the lower limbs, which you will find particularly taken notice of, in most of the examples of tumours on the loins, pointed out above, and in others besides, that I pass by, two of which you will see in the Ephemerid. Nat. Cur. (*e*) by Johannes Burgius: and besides this, a palsy of the sphincter ani and bladder is avoided (*f*), which would sometimes be perceiv'd and remark'd, if children could drag out their lives long, under such a disorder as this. But they cannot, as well for other reasons, as on account of convulsions, which are the consequences of these injuries on the nerves; and so much the sooner, if by opening the tumour, you prick them, or expose them to the injuries of the air. And why convulsions, or palsies of the lower limbs, did not exist in those two children who were cur'd of this disorder, is easily understood, from what has been said of both. And when we could be certain, that none of these exasperated symptoms were present, and that the disorder deriv'd its origin from an external cause; and especially, when we have observ'd all those things which the celebrated Trew cautiously, and prudently, admonishes us of (*g*), it seems that the surgeon might then dare to do something; if, however, it was at any time lawful for him to undertake any thing of this kind, in a disorder so fallacious, and in which we have so many fatal examples of the bad success of surgery.

13. For, to return to the hydrocephalus, the ancient physicians (*h*), indeed, acknowledg'd two species of the internal kind: the one, when water is collected between the skull, and the dura mater; the other, when it is collected between the dura, and the pia mater; teaching, at the same time, that the second species was mortal, but that the first was not incurable; in which, when a tumour appears between the distracted sutures, they order'd, that the most prominent and pointed part should be cut into. But Parey (*i*) expressly denies, that he had ever seen one who recover'd: and Jo. Francus (*k*) testifies, that even the most tumid part being open'd, and pure and limpid water being let out, the infant, "after some hours, fell into an epilepsy, and "soon died thereof:" nor was it of any advantage to have made a discharge for the serum, that was included therein, by a foramen, open'd with the *potential* cautery, as it is call'd, according to the order of Grubelius (*l*), that infant also having died, "a few days after;" whereas those from whom the water was not drawn, liv'd some seven, nine, eighteen, and thirty

(*c*) Obf. 35. sæpius cit.

(*d*) Obf. 36.

(*e*) Dec. 2. A. 6. obf. 58.

(*f*) Eph. N. C. Cent. 1. & 2. obf. 127. & Sect. hac 16. Sepul. in addit. obf. 12. vers. fin.

(*g*) Commenc. A. & hebd. supra cit. ad n. 10.

(*h*) Apud Fabric ab Aquap. de Chirurg. Operat. ubi de Hydroceph.

(*i*) Oper. l. 7. c. 1.

(*k*) Apud Shenck. Obf. Med. l. 1. ubi de Hydroceph. mort.

(*l*) Eph. N. C. Dec. 2. A. 10. obf. 42.

months,

months, as you have it affirm'd in the *Act. Helvet.* (*m*); not to say any thing of that which Riedlinus knew and dissected (*n*), who labour'd under a hydrocephalus four and twenty solid years. There is also an observation ascrib'd to Wepfer by the celebrated Fantonus (*o*), of a rustic, who being impatient of a long, and very violent pain in his head, from water being confin'd betwixt the cranium and dura mater, compell'd a farrier to pierce him on the side of his head, from which a great quantity of serum being discharg'd, he immediately and perfectly recover'd. But suppose that such rashness had a happy effect; suppose that there was a surgeon who was willing to imitate this boldness, in the hydrocephalus of any infant; nor imitate it only, but even, if there were occasion to open the dura mater, as is practis'd after grievous blows of the head, to exceed it; what marks or symptoms shall he safely confide in, so as to lay down for certain, that the water is now betwixt the bones and the dura mater, now betwixt the dura mater and pia, and at another time betwixt the pia mater and brain? Nor are examples wanting of the threefold situation of this disorder; as, for instance, of the first, in the hydrocephalus of Velsius (*p*), in which you have also an instance of the second: and of this also in those dissected by Laubius (*q*), and by the celebrated Jo. Rudolphus Zwinger (*r*): and of the third, in the observation of Fallopius, which you have in the *Sepulchretum* (*s*); and in others of Mayerus (*t*) and Raltschmied (*u*). Let us, however, suppose, if it is possible, that we can distinguish all these situations from one another, and that we could promise ourselves the same success, in the hydrocephalus of infants, as we sometimes see in adults, when they have receiv'd violent blows, at a time that they were in full health, if there was a necessity of cutting into the meninges, and, after that, though they were become lax, or lacerated, or thicken'd, in bringing them to a cicatrix; what? if the brain indeed be under the water, but so flaccid, that you can scarcely distinguish any thing therein, besides the cortical and medullary substance, as in those observations of Mayerus, and Zwinger, which I just now commended: what? if under the cortical, the medullary substance "be all corrupted, and turn'd into water," as in that child of Tombinus (*x*), of whom you also have an account given you, in the *Sepulchretum* (*y*): what? if the whole brain is dissolv'd into "mucous water," or into "a limpid water, somewhat tinctur'd with blood," as in those observations of Kerckringius (*z*), and Laufferus (*a*); or, because this is more rare, what? if from the quantity of water being included in the ventricles, as in the two observations of Dodart, which are made mention of by Bohn (*b*), such a force be exerted on the brain, that the lateral ventricles make one continued cavity with the third ventricle; which very circumstance, it is so much the less possible to conjecture, since some patients from hydrocephali, as those two infants, "labour under other disorders, which can by no means

(*m*) Vid. *Act. Helvetic. Tom. 1. c. 1. n. 6.*

(*n*) *Eph. N. C. Cent. 1. obs. 29.*

(*o*) *Animad. cit. supra ad n. 9.*

(*p*) *Disp. de mutuo intest. ingress. p. 2. obs. 2.*

(*q*) *Eph. N. C. Cent. 10. obs. 83.*

(*r*) *C. cit. n. super.*

(*s*) *2. in Sect. hac 16.*

(*t*) *Eph. N. C. Cent. 1 & 2. obs. 127.*

(*u*) *Progr. de nervis Optic. &c.*

(*x*) *Act. Lips. M. Nov. A. 1686.*

(*y*) *Sect. cit. in Addit. obs. 8.*

(*z*) *Sect. ead. obs. 11.*

(*a*) *Diff. cit. supra ad n. 6.*

(*b*) *De Renunc. Vulner. S. 2. c. 1.*

"be call'd disorders of the head:" or what? if from the weight of the incumbent waters, or their pressure round about, the internal structure of the brain be incurably injur'd; for even the exterior form, and the bulk itself sometimes, by no means resist. So Velsius (*c*) saw the hemispheres of the brain, no more convex, but depress'd in such a manner, that "their height" was in the same plane parallel to the horizon, in which the corpus callosum was." And Parcy found the brain so far reduc'd in its size, that "it scarcely was equal to the bulk of a tennis-ball," which passage is not accurately enough recited in the Sepulchretum (*d*). Thus Stegmannus (*e*) saw the cerebrum "as small as an ox's eye, and hardly weighing an ounce and "half:" add also, that it was, "at the same time, entirely putrefied and corrupted:" which circumstance brings back to my mind, in like manner, grievous injuries of the cerebellum, from a hydrocephalus, as in the observation of Velsius, just now commended, and still more in those of Littre (*f*), and Jo. David Mauchartus (*g*), and in the same from Laubius, which was a little above pointed out.

But for the most part, although the ancients did not suppose this species, the water of the hydrocephalus is in the ventricles, as Vesalius in particular (*b*), and many more besides him, have found it; for instance, Schulzius (*i*), and among those whom I have nam'd before, Laubius, Mauchartus, Riedlinus, and Littre especially, who, in so great a quantity of water, with which the ventricles were distended, found none betwixt the skull and dura mater, nor betwixt this membrane and the brain. I pass by many others, besides Brunnerus (*k*), and those who, like him, have spoken of an extenuation of the substance of the brain, as not very rarely seen in hydrocephali of this kind. Nor did I give these hints only for this reason; in order to shew, that although the surgeon should be bold enough to perforate the meninges, he would nevertheless often meet with no water there, or would not draw off that which was in the greatest quantity, unless he perforated the cerebrum also; but I touch'd upon it for this reason, in order to show you, how easily it might even happen, that while he thinks he perforates nothing but the dura mater, he perforates the brain. I would have you, therefore, join to the observation of Vesalius, those of Hildanus also, and Tulpus, which are mention'd by me in that place, where I shew'd (*l*), that by the force of the water, distending the ventricles, their upper parietes in particular, and their lateral parietes, are sometimes so far extenuated, and affix'd with the meninges, to the bones of the cranium, or pericranium, that it ought not to seem wonderful, if any one, while he supposes, that he cuts only into the cranium itself, should, at the same time, pierce through the dura and pia mater, and even the substance of the cerebrum itself, which adheres to the meninges, and to the bones and pericranium, in the form of a membrane. Please to read the letters which were sent from Jo. Jacob Schenkzer, to our Vallisneri (*m*): you will see, that in the hospital, the hydrocephalus of an infant

(*c*) Obf. supra cit. 2.

(*d*) Sect. hac obf. 12. sed Operum I. 7. non 8.

(*e*) Sect. ead. in Addit. obf. 11.

(*f*) Hist. de l'Acad. R. des Sc. A. 1705.

(*g*) Eph. N. C. Dec. 3. A. 4. obf. 59. n. 9.

(*b*) Sepulch. Sect. cit. obf. 6.

(*i*) Apud Lauffer. in Diss. cit. § 23.

(*k*) Sect. cit. in Addit. obf. 12.

(*l*) Supra ad n. 8.

(*m*) Opere Tom. I. S. 5. in fin.

was open'd with the chirurgial knife, "in consequence of a general consultation, as it was judg'd, that the water was harbour'd betwixt the cranium and dura mater." You will see, at the same time, "how difficult it is to judge in such cases." For though the convulsive motions, which succeeded, very soon, to the first drawing off of water, in the quantity of three ounces, by continuing till the time of the child's death, which happen'd the day after, were suppos'd to indicate, that the dura mater was incis'd; the dissection shew'd, "that not only this was cut through, but the pia mater also, and the brain itself. For the brain was extended, almost to the thinness of a membrane, equal to the internal capacity of the cranium; whereas the bulk of the water, which was, at least, in the quantity of eight medical pounds, had been harbour'd in the ventricles."

14. From so great an extenuation of the brain, and adhesion thereof to the upper part of the cranium, it happen'd, without doubt, in the hydrocephalus of Tulpus, already mention'd (*n*), that when the water was discharg'd, "most of the physicians, that were present, imagin'd, but too hastily, that this was a head without a brain," in like manner as Steno by his calf (*o*), "did not consume a little time, in seeking the brain in the brain itself, and already began, almost, to believe the stories, which he had not before credited, to wit, that men had been found without a brain." And, indeed, it is my opinion, that nearly in this manner, whatever there may be of truth in the observations of this kind, is to be explain'd, especially of those who had not read Tulpus, and Steno; as for instance Garnerus, Zacutus, or any others, who are said, in the Sepulchretum (*p*), where the scholia are given to these observations, to have found no brain. For when one says, "that a very thick membrane supplied the place of the brain;" another, that instead of it, "the dura mater appear'd to be doubl'd," having a most limpid water within it; you easily understand, what this very thick membrane was, or that second lamina, suppos'd to be a doubling of the dura mater, and what might lie hid under that appearance, "of a certain mucosity and phlegm undigested," which immediately offer'd itself to Garnerus, as he look'd slightly within the meninges. At least, as in the same place, you will see the observation of Kerkringius (*q*), who says, "that instead of the brain he found a mucous water." You will also see, in the subjoin'd scholium, that Diemerbroeck suspected much the same as I do, concerning this mucous water, or extenuation of the brain; and yet Kerkringius had not only read the history of Tulpus, but even mention'd it in that of his own, and was speaking of a hydrocephalus in a child, not six months old, who might have had the dissolution of the brain first begin in the uterus, and encrease upon it by degrees, till the brain being entirely dissolv'd, it would naturally die. And Diemerbroeck, besides, objected to him, what you would also object to most who have publish'd histories of this kind, as a very strange omission, that they never once made any mention, whether the cerebellum, and medulla oblongata, were wanting, or not. But in the history of Billotius (*r*),

(*n*) Supra ad n. 8.

(*o*) Ibid.

(*q*) Sect. ead. obf. 11.

(*p*) L. 1. Sect. 1. obf. 86. & Sect. hæc 16.

(*r*) Zodiac. Med. Gall. A. 1. M. Dec, obf. 3.

obf. 13.

which is generally number'd among the others, you not only want this circumstance; but even you find, that the cerebrum itself was not entirely consum'd, since "a portion of its substance was still remaining, though so small, as scarcely to equal a little egg in bulk." So also in the dog, who seem'd to be somewhat mad, or vertiginous, Elias Rud. Camerarius (*s*), (for as to the sheep which Kerckringius (*r*), and others, have written of, the histories generally depend upon the veracity and observation of the butchers) Camerarius, I say, saw "not the least substance of the cerebrum or cerebellum, except a very small portion of the latter, scarcely half so big as "a filbert nut." To all which things, though I have not read them, I confess, without wonder, and even not without some distrust, yet I will add this also. I remember, when I was a young man, and attended every day in the hospital of St. Mary de Morte, at Bologna, that I heard, more than once, Jo. Marc. Bigatti, an honest man, and, at the same time, a physician and surgeon there, of good reputation, when he affirm'd that his predecessor, Jo. Galeati Manzi, a physician and surgeon, who, when living, was to be equall'd by few, had seen this, which I shall relate to you, just as I receiv'd it from him, neither adding thereto, nor diminishing therefrom. Manzi had under his care the wound of a certain man, which being inflicted on the coronal suture, reach'd into the cavity of the cranium; when the patient began, about the twentieth day, to be troubl'd with two things; the one, that as often as the wound was open'd, so often was he affected with convulsive motions of the lower jaw; and the other, that as often as he was ask'd a question, he shew'd by his eyes, that he understood, and would willingly answer, and yet for some space of time, he could not begin the first word; but when he had once begun, the other words easily follow'd. And in this manner nearly, in general, to the very latter end of his life, did he continue, being, to all appearance, in his perfect senses; till at length being taken with a kind of apoplectic fit, he died. His skull being open'd, nothing was found within the cavity, but a fluid, if you except some red, and almost fleshy fibres, which lay under the wound. As I with-held my assent, when I heard this story; so you have my free leave to with-hold yours, when you read it. And, indeed, these things are of such a nature, that unless you see them yourself, unless you examine again and again, with accuracy, into them, as in this case, to determine what these red, and almost fleshy, fibres were, with what membrane, or with what nerves, perhaps, they were join'd, and even after you had examin'd ever so nicely, you would scarcely know what to believe.

The question is here, indeed, concerning the consumption of the brain being the consequence of a wound in the head, as in the children observ'd by Zacutus, and Billotius. But in the first, the space of three years had pass'd, between the time in which the wound was inflicted, and that in which the observation was made; and in the other, the whole cerebrum was not consum'd: in both, perhaps, the cerebellum, and part of the medulla oblongata, might remain. Nor was there a colliquation of the brain, in the second; but only a loss of its substance, which burst forth, at every time

(s) Eph. N. C. Dec. 1. a. 3. obs. 129. in schol.

(r) Spicileg. Anat. obs. 46.

of dressing the wound, to the bigness of a nutmeg. But you will say, in the child of Kerckringius, who was five months old, no wound had preceded; none in that of Tombinus (*u*), which was two years old; none in the girl of nine years old, observ'd by Neuhold (*x*); and nevertheless in her the medullary substance of the brain "was chang'd, as it were, into a most tenacious jelly;" but in the second, as I said before, it "was turn'd into water;" and in the first, the whole brain was chang'd into water. But to me, this very series of changes seems to shew, that the dissolution of the brain happens with so much the more difficulty, as we recede the more from the time of the child's birth, so that the substance of the brain is more firm. But if this really happen'd in that man of Garnerus, you may see, at least, how great, and how long-continu'd afflictions he bore. And how singular a case it was in that very man, may be understood from hence, that it is not easy to find another example of that kind in an adult, amongst all the writers of credit and probity. And, indeed, the woman of whom Ralschmied (*y*) gives the history, although she was so miserably afflicted with the most cruel pains of the head, and those happening after a violent blow thereupon, that unless a quantity of water had flow'd from her nostrils, she could not have liv'd so long; when at length she died, in the tenth year after the blow, he found that the corpus callosum, indeed, was so extenuated by the force of the serum, distending the ventricles of the brain, that "it scarcely had the thickness of the septum pellucidum;" yet was there no such thing as the cerebrum being dissolv'd into mucus. Since, therefore, the dissolution of the whole cerebrum into mucus, in adults, and still more into water, is very rare, especially if it be understood, that whatever is contain'd in the cranium is, at the same time, dissolv'd; you see at once, why, when I heard the case that has been describ'd, I did not give my assent to it; as I have always doubted, when I have heard the same, or much less than this, even of a child; unless it should be added, that he was at the same time without a soul, and liv'd the life of a plant, more than that of a man. But Redi (*z*), nevertheless, having taken out the brain from tortoises, you will say, saw that they still liv'd a long time, and could even walk, sometimes, for six months after. But I speak at present of perfect animals, as they are call'd, and even of man; and you tell me of tortoises, which, as Aristotle himself knew very well, "can perform motions, even when the heart is taken away (*a*).". Besides, Redi himself seems to hint, that together with the brain, the faculty of seeing, and what is probable, of hearing also, smelling, and tasting, was taken away: and Caldesi (*b*) has, certainly, given a very probable reason of motion remaining so long; I mean, the great thickness of their spinal marrow, in proportion to the brain, which, when compar'd to the marrow, is but small. And from this marrow those persons are wont to account for the animal spirits, who take pains to explain the life of foetuses in the uterus, when they are without a brain; whom you may follow so far, provided you do not, however, at the same time, suppose with some, that either the medulla spi-

(*u*) Supra ad n. 13.(*x*) *Commerc. Litter. vol. 1. specim. 22.*(*y*) *Progr. cit. supra ad n. 13.*(*z*) *Degli Anim. viv.*(*a*) *L. de Juvent. c. 1.*(*b*) *Osservaz. int. alle Tartarughe.*

nalis is always thicker in them; or that, because it sends out many more nerves than the brain, it also sends out many more spirits, even at the time when it can certainly receive no more spirits from the brain, from which it is wont to receive the greater part at other times; or that this medulla certainly exists in all these foetusses; whereas I have mention'd many above (*c*), who had nothing at all, but water perhaps, within the cranium, and in the tube of the vertebræ.

But you will, perhaps, object, that they had both brain and marrow, before either, or both of them were dissolv'd by the water, or were oppress'd, or thrust out, by some other force. And in this you imagine more happily than most of those, who, having attempted to explain the question, have by no means attended to this circumstance. But if, to go up to the very origin, you contend, that, in one place, and the other, there never was any thing but moisture, and that the spirits are to be accounted for from the ganglions of the nerves, indulging in some measure that suspicion, which I formerly, though but in two or three words, touch'd upon (*d*), that in the ganglions of nerves "some secretion of spirits was probably made;" I indeed, although lately, in particular, in two ganglions of an adult, the one of a moderate, and the other of a very great thickness, amongst those nerves which go to make up the cervical, presently to become the brachial; although, I say, in these ganglions, when dissected longitudinally, I plainly saw a substance of a cineritious colour, degenerating to brown, and demonstrated it, which being nowhere mix'd with the white, (the quantity of which was much greater, and its situation external in the ganglions) follow'd the axis of the ganglions, yet I dare not add any weight to this suspicion; and if I dar'd, I should believe, that there was, perhaps, some room for such a suspicion, in those foetusses only, whose brain and marrow had been destroy'd, in order to preserve them for some time; but not in those, who had never had, either a brain, or spinal marrow. But if you should, perhaps, still think, that you must nevertheless persist in such an opinion, which I cannot believe; this one thing I will say, that if the first and last part of the life in the uterus, seems to you to be capable of comparison with that which adults, of whom this discourse was undertaken, lead, in perceiving, thinking, judging, answering, and, as occasion requires, in moving, you have the better of the argument; but if not, you must then take part with me in the question.

15. You have of the hydrocephalus, and especially of watry tumours of the spine, so much the more here, as they are the less commonly known among us than other disorders: for they are very rare in this country; not, as in some others, so frequent, that within fourteen months, Burgius (*e*) saw three at Vratislavia. But if you should desire still more concerning each disorder, the celebrated Jo. Rud. Zwinger (*f*) will be able to satisfy you on the subject of the hydrocephalus; by whom, when I revis'd this letter, I not only saw examples thereof collected, but also diligently and separately compar'd one with another. And in regard to aqueous tumours in the spine, beside George Frederic Orthius, in a dissertation (*g*) that he gave out, when

(*c*) N. 8.

(*d*) Advers. Anat. II. Animad. 34.

(*e*) Eph. N. C. Dec. 2. a. 6. obs. 58.

(*f*) A&H. Helvetic., vol. 1. c. 1.

(*g*) De quibusd. Tumorib. Tunic. Externis.

Jo. Saltzmann was president, which is very useful and worthy to be read; those very learned men, Platner (*b*), and Trew (*i*), may be referr'd to: the first of which, when he made some little observations upon tumours of this kind, pointed out himself also the names of many persons who have written the histories of them: and the last not only added other authors, but also gave his own observations; and, considering all things well, treated this subject, perhaps, more thoroughly, accurately, distinctly, and at large, than any other person whatever; nor did he omit to mention, how he conjectures, that the cure of these disorders may be attempted and perform'd. And if the writings of all those authors had come into my hands, before I first sent these letters to you, I would certainly have taken pains to procure some books which I am at present without. Nevertheless, I have taken notice of the greatest part of the examples, which are extant, of either disorder, as you will now be able to see; and I have added some other things, which are either overlook'd by those whom I commend, or not yet publish'd when they wrote; which is very easy for all who write last to do. In the mean while, you will make use of these notices, with which it was in my power to furnish you. Farewel.

16. I had scarcely seal'd up this letter, when that circumstance happen'd to me, which never happen'd before, and was the more surprizing at this juncture, as I did not in the least expect it, or even think of it; I mean, that a child was brought to me for advice, on account of a tumour being prominent about the lumbar vertebræ. While they were taking off its clothes, for me to look at it, I ask'd them, whether he was strong in his lower limbs? and when they answer'd in the negative, I ask'd, whether the tumour was pellucid, as if it contain'd water? to which they answer'd in the affirmative, wond'ring at the same time that my questions were so pertinent to the case. What I had concluded from their answers, I presently found to be, in fact, true. The tumour, indeed, was sufficiently soft; and the contain'd water, in many places, very evidently shone through the parietes. This tumour, having been very small at the time of birth, within ten months, had grown out to the bigness of a fist; so that it was very much like, in its form, as well as its situation, to that which Ruyfch has given a plate of (*k*). The boy was large-made, strong, and well-nourish'd, even in his lower limbs, in which he was only weak; and proportionably shap'd in every part, except that his head was bigger than it should be, which, though in other respects sound, immediately struck the attention of every one: I say, he was well-made, also, in those limbs which I spoke of just now; so that from this new example, added to many others, I was confirm'd in my opinion, that they are deceiv'd, who suppose all the children, that labour under a tumour of this kind, to be born with distorted feet, for this reason, because they have observ'd, that some of them were thus born; amongst which, whether they with justice place that girl whose history is given by Stalpart (*l*), you

(*b*) Progr. cit. supra ad n. 11.

(*k*) Obs. Anat. Chir. fig. 36.

(*i*) Commenc. cit. supra ad n. 10. hebd. 20,
& 21.

(*l*) Part. 1. Cent. 2. Obs. Rar. 34.

yourself will judge. I plainly see, indeed, that her feet were miserably distorted; but it is by no means so clear to me, that the tumour, with which she was deform'd in her loins, was of the same kind with those we treat of at present.

But to return to our boy: not being ignorant of the excessive credulity of other people, at some times, I ask'd, however, from the mother, whether, as she was in the flower of her life, and both she and her husband healthy, she had ever fall'n on her back, while she was pregnant with this child, which was her first-born, or had receiv'd a blow in that part by any means, or had dreaded, or been frighten'd at any thing; or, in fine, whether she had long'd for any thing: all which she immediately and expressly answer'd in the negative; although afterwards, as the custom is with these weak women, it came into her mind, that she had wish'd for a fig.

But in regard to the advice which I gave them, as I expressly affirm'd, that the child could not be cur'd, I also took pains to inculcate this again and again, to take care that no-body attempted to open the tumour; for if they suffer'd this, the child would die so much the sooner. The father and mother of this child were country people; as also the parents of that child, whom I mention'd above (*m*), in whom a tumour of the same kind communicated more with the cavity of the cranium, than with that of the spine. But they were wise enough to be afraid of the danger, which I had foretold; and bidding adieu to the surgeons, carried their child home again, that it might live as long as it should please God to permit it. Yet the parents of the child I am speaking of now, were no sooner departed from me, but they happen'd to light on a surgeon, who confess'd, indeed, that he had never seen such a tumour, and was ignorant what it was; as most of the surgeons and physicians, who inspected it before me, had done; and nevertheless, what they had not dar'd to do, because they did not understand its nature, he promis'd that he would cure it for them. Being persuad'd by the age and confidence of the man, they easily believ'd what they ardently desir'd. This man, then, although he was afterwards, by accident, well-inform'd of the advice they had receiv'd from me, being obstinate in his design, thrust a knife into the middle of the tumour; upon which a clear water immediately burst forth, in colour somewhat like urine, and not in small quantity, but, at last, like that in which fresh meat has been wash'd. The water being discharg'd, the surgeon put a thick tent into the orifice, which being drawn out every day, the wound discharg'd every day fresh water, as long as the child liv'd. But he did not live quite through the third day after the tumour was open'd. And from the time that it was cut into, he never ceas'd to cry and weep, though he had been chearful before, and much given to laughing, and almost to have an aversion to the breast, of which he had been always very covetous. In the mean while, he often trembl'd in his whole body; his face, which was before smooth and well-colour'd, began to be wrinkl'd and pale; and, in short, all things portended evil. Yet the surgeon alone still hop'd for good success, even a few hours before death attack'd the child; which came upon him gradually, with a slight difficulty of breathing. At length, when I was in-

form'd of all these things having happen'd, I bore it hardly indeed, that the child was inadvertently destroy'd; and as to what now remain'd to be done, being desirous of examining the internal contents of the tumour, I immediately went to the house, where the parents had carried the child a little before its death; which house belong'd to a neighbour, and a friend of mine. There, by chance, having met with the surgeon, who was desirous of the same thing that I was, although I did not omit to blame, as indeed my duty was, his late supreme confidence, and destructive boldness, a little more severely than my nature and custom, which are very well known to every-body here, incline me to do; yet that he might be more cautious and considerate for the future, as he was now very docible, and entreated it of me, I immediately consented, and promis'd him that I would be present, while the tumour was dissected, and explain the contents of it to him.

Although the parietes of the tumour were collaps'd and rugous, and, for this reason, thicker than usual; yet when they were press'd, a pretty considerable quantity of water issu'd out of the wound, which smell'd a little strong, and was like a pale urine; which likeness, as I have said, being observ'd in former days, and being made known among the surgeons, had been the means⁽ⁿ⁾ of making some suspect here also, that the urinary bladder communicated with the tumour. The parietes being cut into, by two lines crossing each other, while the flaps were carefully drawn asunder, as I directed, the spinal marrow evidently appear'd, invested with the pia mater, which was universally red with distended vessels; and the body of the marrow, together with the nerves that come from it, adher'd closely, almost to the middle of the parietes of the tumour, longitudinally^(o); so that I was oblig'd to separate it myself from them, gently with my hand; and it was evident, that the other coats of the marrow had coalesc'd into one substance with the same parietes. Nor was the marrow soft or fluid, but even then sufficiently firm; which I perceiv'd, by pressing it betwixt my fingers, and soon after confirm'd, by cutting it in a transverse direction, and finding that the white substance round about, and the cineritious internally, were both of them pretty solid. But the tumour had a large sinus in every direction, the bony parts of all the lumbar vertebræ, which us'd to be behind, being press'd to the sides, and consum'd even to their very bodies, which made the anterior paries, or boundary, of the tumour. There was nowhere any putrefaction, nowhere any blackness.

Although the circumstances, which I have related to you, I am as certain of, as it is possible to be, in every respect; yet the body of the marrow itself did not stop at the first vertebræ of the loins, but was produc'd almost to the os sacrum, as I perceiv'd both by my eyes and my hands. But whether this happen'd here from a peculiar structure, or because in the beginning, the body of the marrow being connected to the posterior paries of the tumour, as this gradually increas'd, and curv'd itself outwards, the marrow might also increase, and follow it, is not, I think, easy to determine. And this consideration made me desirous, moreover, of examining the upper vertebræ, and, in short, of opening the head, which was so large; especially as when this

(n) Vid. supra n. 11.

(o) Vid. ibid.

was compress'd, although it did not seem to give way, some water had fall'n out of the evacuated tumour, before it was open'd by us: which, I suppose, happen'd more from chance, than from any thing else; for when the tumour was dissected, the head being again compress'd, no water issu'd out of it. But neither the time, nor the place, nor, in particular, the cries of the parents, who, as I said, were ignorant country-people, and who had with difficulty, and not without tears, permitted me to proceed so far, as to dissect the tumour, suffer'd me to observe any thing more in this subject. As I did not doubt, but this relation would be very pleasing, I was determin'd to pen it down here, on the very day that I examin'd the tumour, which was on the fourth of September, in the year 1745. Again farewell.

LETTER the THIRTEENTH.

In which the Catarrh is briefly treated of; but affections of the Eyes more at large.

I. **T**HAT water really flows down from the cavity of the cranium, into the tube of the vertebræ, is confirm'd by me also, in the last letter which I sent you. But the ancients made no doubt of humours being drain'd down from the skull, upon the eyes, ears, nostrils, mouth, chest, belly, and limbs, as well as into that tube. Which erroneous doctrine, that was rather the fault of the times, than of the men, it would have seem'd to be the peculiar study of Bonetus, in the seventeenth section, which is entitled *de Catarrho*, to root out; if at the same time, for want of being sufficiently steady in his purpose, he had not interspers'd some things, here and there, which patronize this doctrine. These you will find in several places, but particularly in a certain prolix scholium, which being taken from Willis, he subjoin'd to the eighth article of the appendix, to observation the sixteenth, as if he had not, already, given a part of the same scholium, even in the former section, under observation the sixth, and, perhaps, in other places; and as if he had not made observation the seventh, out of a part of that scholium, in this very seventeenth section. But it is sufficient for me, who am not fond of repeating what has been said before, to admonish you, that on whatsoever seat of the body, the ancients thought a catarrh might flow down, that part is always furnish'd with glands of its own, which discharge a larger quantity of humours than natural, and has, likewise, its own vessels, from which these humours flow out, betwixt the fibres and membranes; so that there is no occasion to fetch them so far as from the brain, and bring them down through impervious ways. This will be made manifest in other places: but here it may be in part understood; first, indeed, from the things which I shall hint of the disease, that is call'd the suffocating catarrh; and, in the next place, from the greater number of things, which I shall immediately

immediately add, concerning the affections of the eye; of which the next, and eighteenth section, of the *Sepulchretum*, treats.

2. That the term *Catarrhus suffocativus*, or *presfacativus*, “is not to be found in the monuments of the Greeks,” but, finally, in the interpreter of Mesuë, Valeſco de Taranta, Savonarola, and others more modern, you will know from Schneider (*a*); who will also teach you, how many different diseases it signifies, among different persons: or, if you choose to avoid so long and tortuous a lecture, the observation under number eleven, and fourteen, and those two which are subjoin’d to this last, in the seventeenth section of the *Sepulchretum*, will partly point out to you, the substance of it. Some of them are said to be the effect of corrupt lungs; some, of a flaccid brain; and others of polypi of the heart, or brain. The effect of which causes, and others whatsoever, that are able, in reality, to bring on suffocation suddenly, or the danger of it, I do not believe, seems equally worthy of the name of catarrh, as an effect of that universal constitution of glands, in the *aspera arteria*; so that they discharge a great quantity of humour in a short time, especially if the bronchia are already either half-full of a humour of that kind, or from any other cause whatever, half-clos’d and obstructed. For a large and sudden defluxion of that humour, whether it be from a laxity, or from a plenitude, of those glands, turgid from any cause whatever, with a great quantity of blood, may not only occasion a sense of a catarrh, as if it were flowing down from the head, upon them, but may really suffocate. Turn now to the scholium on observation the fourteenth, and, in like manner, to the latter part of the scholium to number sixteen, and you will find, that I follow Willis, and Fernelius; the latter, in that I require, at the same time, an infarction of the lungs, and defluxion, to make up a suffocating catarrh; and Willis, in that I do not deduce the defluxion from the head; nor yet, immediately, from the vessels of the larynx, and the other parts of the *aspera arteria*, but from the glands, which are, elsewhere, describ’d in both. And, to a suffocating catarrh, thus explain’d, I should believe, that the death of a man, most eminent for his piety, nobility, and dignity, was to be imputed.

3. J. Giovanni Francesco Barbadici, a cardinal of the holy church of Rome, and bishop of Padua, being almost seventy-two years of age, and subject to catarrhs, was more readily taken with that catarrhal fever, which seiz’d almost every body, in the month of January, 1730. And as he took less care of himself, than others did, he was one of the few who perish’d, in consequence of it. For he found himself seiz’d with the disorder, in the night of the twenty-second of January. Yet he rose on the next morning, being a man of great courage, and expos’d himself, frequently, to the injuries of the air; not only from motives of the public office, which he sustain’d, but trusting also in his strength, which, together with his habit of body, and colour of his complexion, seem’d to have become much better, even than usual; after having, two months before this time, recover’d from a short, but most violent fever (*b*). He even rose the next morning, and perform’d the duties of his sacred function; but the disease, in the mean while, grow-

(a) De Catarrh. l. 5. f. 2. c. 4.

(b) Vid. Epist. 49. n. 30.

ing more violent, he was forc'd to take to his bed on the same day, and then sent to the physicians for the first time. But out of three of us, who had been with him, in that former fever, Vallisneri had died, seven days before, and his physician in ordinary, and I still languish'd under one common disease; which circumstances I relate to you, for this reason, that you may not wonder, when I tell you, that I heard some things relating to the disorder, symptoms, and death, of the patient, and all that relates to the dissection of him after death, from persons who certainly deserv'd to be credited, and whom I very accurately interrogated upon the subject. For I was able to visit him but twice, though I was sent for several times over; and then was carry'd, not without considerable danger to myself, to this very great man, who deserv'd well of every body. My first visit was on the twenty fifth of January, and my second, on the twenty-sixth; and I heard, that he slept in the night after first taking to his bed; and that he had expectorated much, and very freely, which he did also at that time; the matter he spat, being very thick, and ting'd with a kind of red colour, degenerating into yellow. His aspect and colour were natural, his cough was easy, and he could lie easily on either side, when he pleas'd; he had no sense of weight, pain, or heat in his breast; his thirst was slight; his tongue moist, and white. The discharge by stool, was in every respect, like that of a healthy body. His urine was, by reason of the coldness of the season, already turbid, but, which was the only thing I could judge of, without any high colour. His understanding was quick; but when he sought for a particular word, he did not call it to mind. His pulse was neither weak, nor small, but even strong and great: not hard; but somewhat tense; and, at the same time, very frequent. The respiration was suitable to such a pulse; and, with it, was a kind of bubbling noise, as if the catarrh was boiling in the lungs. It was now manifest to all, not only to the physicians, that the disorder, which had been despis'd on the first days of its appearance, had degenerated from its nature, and was become grievous, and dangerous, and not slight, as it seem'd to the patient only, which was by no means pleasing to me. But the day after, I was still more displeas'd with the same judgment, which the patient gave of his own disease, when I heard, that he had pass'd the night without sleep; and that his expectoration, which, in the middle of the day, had become white, and been in little quantity, was, at that time, none at all; and saw, that his respiration was much more frequent, and deep-fetch'd, notwithstanding they had taken pains to raise him up a little, by putting pillows under his neck and back; that his thirst was encreas'd, so as to make him wish for cold water; and his stomach languid, so that he ask'd for a little wine. For though he was, in other respects, as he had been the day before; and the pulse was even soft, less frequent, and, at the same time, sufficiently large and strong; yet we were very solicitous on account of the other symptoms; and on account of this, in particular, that his cough continu'd violent as before, yet he expectorated nothing. Therefore, going away suspended in my mind, and even sad, and foretelling every thing that was bad, unless his expectoration return'd, I recommended many things to the physicians; but especially this, that they, who were well, should visit him often; and should assist him as occasion requir'd, according to custom; and,

moreover,

moreover, in the manner that had been agreed upon, among us. One of them return'd soon after, nor found any appearance of his being worse. Two others came also, within the first and second hours of the night, and found that the pulse was still better, and that he had even expectorated a little : but it was not an hour after they were gone, and not even many moments of time, after some other men had left him, not physicians, indeed, but persons accusom'd to be very long, and attentively, about the patient; who having observ'd no change at all, had gone to lie down in the next chamber; when the patient, stooping down, to lift up something which had fall'n from the bed, but not being able to reach it, call'd up his servant from the little bed that was by him. Who running to him, and placing his master in his former situation, he said it was not possible for him to continue in it, but would be rais'd up, that he might breathe better; and both of them found, that death was at hand. Wherefore, the servant, who was able, calling for help with a loud voice, a priest immediately came to him, who found him dying indeed, but perfectly in his senses, touching his own breast, as well as he could, with his trembling hand, and marking out the form of a cross thereon, while his fault'ring, but pious voice, now and then, interpos'd the most sacred murmurs. And in this manner, very soon, as he had, above all things, wish'd, did this prelate, who was worthy of a much longer life, breathe his last, in the arms of the priest, having scarcely completed the fourth day, from the beginning of the disease.

The body being dissected for embalming, nor being found without fat; the brain, and all the viscera of the belly, appear'd to be sound; except that the liver seem'd to be very large, brownish, and somewhat hard; but, without doubt, this was natural, since there had been no peculiar mark of this viscous being diseas'd, either in this disorder, or before. And, without doubt, the spine of the thorax having been distorted, from the time of his being a boy. so as to resemble the letter S, made one of its cavities much more straight and confin'd than the other; and consequently, the lobe of the lungs contain'd in it, was less. Yet into neither cavity was any fluid extravasated. There was nothing polypous in the heart. The lungs had their surfaces quite free, and unconnected to the ribs, and the diaphragm, which was sound. But the external surface of them was whitish, and had the appearance of being smear'd over with a kind of *vernice*, or varnish, as we call it, which was inclin'd to a milky colour. The lungs themselves were heavy; but from the catarrhal defluxion that they contain'd, which burst forth in great quantity, from the bronchia, wherever you cut into them. And certainly, the whole of their substance was so far from being dense, or compact, that it was found to be flaccid.

4. If you compare this history with what I have hinted above, in regard to the suffocating catarrh (c), you will certainly explain it in a manner agreeable to my opinion. A great quantity of the catarrhus humour was now in all the bronchia of the lungs, as the dissection has confirm'd; so that shining through the thin membrane on the surface, the lungs, for this reason, I suppose, seem'd to be smear'd over with a white varnish. Nothing

at all of this mucus could be thrown up on the last day of his disease, as the lungs were then growing more and more flaccid. And to this, by reason of the sudden and improper motions which he us'd, another difficulty was added; whether it was from a defluxion, falling down from the larynx, and superier parts of the aspera arteria; or whether it happen'd on account of that inclination of the spine, by a humour devolving from the lobe, which was perhaps already too full, and therefore uselefs, to the other, which was half-full, and by which respiration had been hitherto preserv'd: and if this lobe was much less than the other, you very well conceive how easily and how soon, even from a small quantity of humour, which partly fell suddenly upon it, in this manner, and partly continu'd to flow down from above, this lobe also, might be render'd uselefs. And thus you will explain his sudden death: which to account for from an apoplexy, as some chose to do, in the case of a most serene prince (*d*), would be much less allowable here, because, besides "sense and voluntary motion being found, and perfect, even " to the very last breath, together with the speech, which all physicians give " their assent to, as the most certain signs whereby a suffocating catarrh is " to be distinguish'd from an apoplexy," there was no mark of disease in the brain. In that prince also, " the spine of the back was like to the letter S," and from the lungs, when cut into, issu'd " a pituitous and whitish humour:" which being consider'd, other physicians, who thought more rightly of the case, quoted the opinion of Heucherus: " We are, in particular, to suppose that those are suffocated by a catarrh, in whom the serum, " or lymph of the blood, being vitiated from any cause whatever, very copiously occupies the organs of respiration, and obstinately stagnates in the " bronchia and vesicles of the lungs."

And in our patient there was no polypus of the heart, which formerly you would have accus'd, in conjunction with others: although I shall tell you in another place (*e*), what I think of polypi of the heart, and it were sufficient at present to produce the opinion of a learned man (*f*), who acknowledges them, but differs from those who account for suffocating catarrhs therefrom. " The cause," says he, " in suffocative catarrhs is evidently enough perceived externally by the ear, while the viscosity, being copiously carried " down into the bronchia of the lungs, renders the respiration sonorous, so " that the matter of the catarrh seems in them to be as it were boiling. " Then, after death, when the dissection is perform'd, the cause of the " suffocating catarrh occurs to the eyes, and the hands, while the bronchia " are found to be almost universally fill'd with viscidities " Wherefore there was in this most eminent prelate, a suffocating catarrh; I had almost said such a one as that was, of which the celebrated Jo. Seb. Albrecht (*g*), when speaking of a woman of sixty, in another epidemical catarrh, has written thus: " She died suddenly, of a suffocating catarrh, which succeeded to a peripneumonic fever." For in our case, not only the principal signs of a pe-

(*d*) Hist. vide in Append. Vol. 7. Aët. N. C. n. X.

(*e*) Epist. 24.

(*f*) Aët. modo citator. Vol. 4. in Append. n. IV. § 7.

(*g*) Commenc. Litter. A. 1743, hebdom. 14. n. 1. in fin.

ripneumonic fever were wanting in the patient, while living, but also that peculiar mark of disease in the lungs after death, which I shall speak of hereafter (*b*).

But this epidemic constitution of ours, which was productive of catarrhal fevers, began in a cold and dry air, the sky being for a long time, both night and day, serene; which state of atmosphere succeeded to a long course of constant rains, south winds, and a warm damp season. And you know Hippocrates (*i*) has taught, that this succession of seasons, although at other times of the year, is always the cause of various disorders, among which he expressly threatens old men, "with defluxions which are speedily mortal." And indeed some other old men died among us at that time, though few. But people in general were seiz'd promiscuously of every age, on occasion, as it seem'd, of the cold air, and had a fever, cough, and catarrhal expectoration; but all these symptoms, if not neglected, were, for the most part, slight, short, and salutary. And I cur'd myself, in fact, in the easy manner which I shall tell you of presently, and which I was then wont to use, if at any time a little catarrhus fever seiz'd me in the winter; from which I preserv'd myself, and my family afterwards, even when it recurr'd epidemically, and that for many years together, by using no other vegetables, by way of salad to supper, in the winter, than boil'd collyflower. But as to the method of cure; on the very first signs of perspiration being obstructed, and a fever coming on, I went to bed, and was cover'd well with clothes, and us'd the safest of all remedies, little and fluid nourishment; for in the morning I drank a basin or two of weak broth warm, as indeed I took every thing warm, and waited quietly till it should go off by the skin, or by urine, or by both ways together; then, moreover, I added a third, and a fourth. Thus the fever soon remitted, and not long after went quite off, unless perhaps I was so bold as to rise too soon, and expose my body, while it was yet weak and sensible, to fresh injuries of the air. Moreover, I heard that the same epidemical constitution had, almost at the same time, spread wide through France and Germany; as I have read of other disorders of this kind, as related in medical writers at other times. Some of which are mention'd by Jo. Godfr. Bergerus, in the dissertation (*k*) that he formerly set forth under his uncle Fasciuss; to wit, "That epidemical catarrhs, such as in the year 1675, rag'd through almost all Germany and France, as observ'd by Forstus, book the sixth, observation the third," (that is, through Holland, Germany, and France, in the year 1580) "and the same have been observ'd by Valesco de Taranta, at Montpellier, in the year 1387:" in which very year indeed, even in the place of my nativity, so far distant from France, in the month of January, epidemical coughs, with catarrhs, and slow fevers, were so general, as to spare nobody, although they kill'd few, as the historical monuments of my country (*l*) testify.

5. Hitherto you have seen the catarrh, whereof the seventeenth section of the Sepulchretum treats, explain'd, without supposing a defluxion of hu-

(b) Epist. 20 & 21.

(i) Sect. 3. Aph. 12.

(k) De Circul. Lymphæ c. 2. § 7.

(l) Marchesi Supplem. Istor. di Forli l. 6. all'A. 1387.

mours from the brain. And you will now observe, whether I make use of this defluxion, to explain the disorders of the eyes, of which the eighteenth section treats. And especially in explaining that, to which the first observations relate, I mean the amaurosis, which was formerly term'd by barbarians *gutta serena*; *serena*, because we then see the eyes clear, and without any disorder that is perceivable by the senses, if you except the pupil being, for the most part, larger than usual, and almost immoveable; and it was call'd *gutta*, because physicians made no doubt, but that an obstructing tumour falls down from the brain upon the optic nerves, from whence they also concluded, that this disorder always attack'd suddenly. Neither of which is necessary; for that they also happen by degrees, the observations of Brunnerus (*m*), Laubius (*n*), and Kaltichmied (*o*), teach us, besides others, two of which you have in the Sepulchretum (*p*), wherein, if you consider, moreover, the nature of those causes, which have produc'd an amaurosis, you will easily perceive, that even what I have said is confirm'd thereby; and they who would sometimes willingly find out obstruction to be the cause of this disorder, may look for it in those parts of the brain, whence spirits are carried into the optic nerves. Nor indeed was it the opinion of Platerus himself, and Spigelius, unless very rarely, that an obstruction of these nerves should be accus'd, in this disorder of ours, as you will learn from the scholia, that are added to those observations, which I just now pointed out in the Sepulchretum. And you will even see Platerus has taught us, that the cause of an amaurosis, which frequently follows violent and frequent convulsions, "is not to be deduc'd from an afflux of humour, as others would have it," but that it is to be accounted for from convulsions of the eyes themselves; for that the eyes are then also, together with the other parts, "also distorted and convuls'd, and at the same time very much thrust outwards, and infected, the optic nerve, which is attach'd to them, being, "by this means, too much stretch'd, and dragg'd out, and in consequence "thereof, distorted and injur'd." Which doctrine may seem to be confirm'd, in some measure, by another observation, that you will read a little afterwards (*q*), in which "both the optic nerves" were found to be "not obstructed or streighten'd, but distorted," whereas the amaurosis had happen'd "from childhood;" in which age, doubtless, convulsions happen the most frequently, according to that aphorism (*r*) of Hippocrates himself. But I have already declar'd in a former work (*s*), when, and how far, I think, we are to give credit to explications of this kind; where many examples are also produc'd of an amaurosis arising from convulsions, and going away after these are overcome. And I would not encrease the number of these here, since you may, of yourself, in the volumes of the *Acta Cæsareæ Academiæ* alone (*t*), and especially in the *Parallelismus* of Lentilius (*u*), find a great number more. It is enough to add this to what I then wrote. When an occasion having there offer'd (*x*), by a double amaurosis of this

(*m*) Eph. N. C. Cent. 1. obs. 69.

(*n*) Earund. Cent. 7. obs. 39.

(*o*) Progr. de Nervis Optic. &c.

(*p*) Obs. 1 & 5.

(*r*) 25. Sect. 3.

(*q*) Obs. 8.

(*s*) Epist. Anat. 18. n. 3. & seqq.

(*t*) ut Cent. 1. obs. 78. & 130. Act. Vol. 3. obs. 44. & Dec. 3. A. 9. obs. 36.

(*u*) Dec. ead. A. 7. in Append. n. 10. ad obs. 50.

(*x*) n. 7.

kind

kind being describ'd from the papers of Valsalva, another was mention'd by me in a certain matron, which was the consequence of a wound "above the eye-brow," slight in appearance; and the same was explain'd from an injury done to the ophthalmic branch of the fifth pair of nerves, as it goes out from the orbit, and ascends over that to the forehead, according to what was said before concerning the convulsive constriction of the optic nerve; and that an explication of this kind, also, might be in great measure accommodated to that passage in the *Coacæ* (*y*) of Hippocrates, τὴν δὲ ἐπὶ τῆς ἀμαυρώσεως, &c. that is, "but the sight is obscur'd in wounds which "are inflicted on the eye-brow, or a little higher." And you may see, in what manner Jacobus Hollerius (*z*), Desid. Jacotius (*a*), and Ludovicus Durerus (*b*), have endeavour'd to account for the cause of this amaurosis, in their commentaries on the passage.

But whether there can be room for that explication of mine, in the amaurosis also, which is describ'd by Elias Camerarius (*c*), I would have you yourself think and determine. For although that history contains many things, the cause of which you certainly can with so much the less ease comprehend, as it is less determin'd how far the wound at length reach'd; yet, as it was inflicted exactly "on the internal canthus of the left eye, and on the confines of the upper eye-lid," you plainly see, that nervous twigs from this same ophthalmic branch, of the fifth pair, come to that place; as the table of all the nerves of the face, which was prepar'd, with the most consummate diligence, by that excellent professor of anatomy, Meckel, and publish'd by the famous and royal Academy of Sciences at Berlin (*d*), very clearly demonstrates. And all these things I am the more pleas'd to have added here, because when I revis'd this letter, I found, from books that were brought to me, much later than I would have had them, that very celebrated men, who with great honour took notice of, and explain'd, the observation of Valsalva, and even mine, on an amaurosis of this kind, did not omit the mention of that passage of the *Coacæ*, whom I nam'd just now; Martianus being, moreover, added, whose interpretation of the passage I have not yet been able to find, in the place where it ought to be. And among the dissertations which I lately read, was that of Jo. Bened. Godofr. Oehme (*g*), which if you will read over, you will be able to collect other causes of the amaurosis, many of which, indeed, but not all, I undertook to mention here; and, besides those you have there, to add to the Sepulchretum, the dissection (*h*) of a young man, who died after this disease, communicated to the learned pro-

(*y*) Sect 3.

(*z*) Comment. in Coac. l. 1. f. 3, 19.

(*a*) Ibid.

(*b*) In Coac. l. 3. tr. 2. c. 2, 12.

(*c*) Eph. N. C. Cent. 3. obs. 55.

(*d*) Histoire a. 1752. Class. de Philos. Experim.

(*e*) Dissert. de Omb. Calvar. p. 1. § 16. & not. p.

(*f*) Vid. 'Aët. Erudit. Lips. a. 1751. m. Sept. p. 2. ad pag. Probust. 167, & seqq.

(*g*) De Amaurosi.

(*h*) § 8.

fessor Gunzius, who was then living, by a physician at Copenhagen; as, in like manner, an explication of the observation of Valsalva, and others like that (*i*). And I would have you observe, that where-ever the ciliary nerves, being drawn into consent, are suppos'd to help forwards the explication of amauroses observ'd, and describ'd, by Valsalva or me, it is not that they are to be consider'd as having already enter'd the eye, in which at that time no disorder was seen belonging to the iris, but as closely accompanying the involucre of the optic nerve, and as being able to compress them, if they are distended themselves, either by distending them also, or at the same time constringing them, together with the included marrow of the nerve.

6. Moreover, there are still other causes which compress the optic nerves, and therefore bring on an amaurosis, taken notice of in the Sepulchretum, and confirm'd also by medical observations (*k*); as, for instance, too great a quantity, and turgescentcy, of blood, swelling the arteries and veins, which internally and externally accompany the soft substance of these nerves. And this explication is rightly us'd by Boerhaave (*l*), in order to explain the amaurosis of Aetius, which "follows after a phrenzy, and other very hot disorders of the head:" nor would he use it improperly, who should thus explain those examples of women, whom Rolsinc mentions (*m*), "who, as often as they were pregnant, were always blind, to the very time of their delivery;" or others, which, with the celebrated Heister (*n*), we must refer to the same class. To this Wepfer (*o*) has added, "that a humour distilling" from the vessels which I mention'd just now, "was sometimes the cause of a gutta serena."

But you will see some very clear instances of that compression of the optic nerves, from which an amaurosis arises, produc'd in the Sepulchretum; as when (*p*) a large and violent kind of struma was generated in the anterior part of the brain, and upon the very origin of the optic nerves (to wit, being more evident than their origin, and more readily occurring to the eye); or when (*q*) a remarkable bladder, full of the most limpid watry matter "had occupied" those nerves "about their crucifixion," that is, where they are join'd one with another. But that observation is not equally easy to be explain'd, in which (*r*) the cause of blindness is said to be found to have been "a stone, of the bigness of a pea, in the origin, and even in the very substance, of the optic nerves;" unless you, perhaps, understand, that there was a like stone on each side; for one of that smallness could not be in the substance of both the nerves, and press upon the origin of both, whether you mean that manifest part of them which is spoken of now, or the other that is more internal. Which internal substance was, as I very well conceive, compress'd in that case of blindness, where (*s*) a tumour, "of the bigness of a fist, lay betwixt the cerebrum and cerebellum;" and from the same tumour, in fact, not from that little stone, I conceive, that death was brought on. But lest you should, perhaps, object to me another observation (*t*), in which, although

(i) Ibid.

(k) Append. ad obs. 2. hujus sect.

(l) Prælect. Inst. § 516.

(m) Disp. de Gutta Serena, c. 5.

(n) Diss. de Amau. n. 12.

(o) In Additam. ad hanc 16. sect. obs. 3.

(p) Ejusd. sect. obs. 1.

(q) Obs. 2. (r) In Addit. obs. 2.

(s) Ejusd. sect. obs. 10.

(t) Ibid. obs. 14.

both eyes suffer'd a diminution of sight, yet a disease of any consequence was found only on the right side of the brain; or that very observation which I have already (*u*) describ'd to you, in which the same part of the brain only had an injury, and no inconsiderable one, whereas both eyes were equally affected with an amaurosis; I would have you read both observations over again. For in the first, as it is given more at large in the second section (*x*), when you shall see, "that in both eyes evident beginnings of a suffusion " might be seen," you will wonder, perhaps, why it was not soon after pointed out, among the cases which refer'd to suffusion. And mine, certainly, shews, that some injury was not wanting even on the left side of the brain, since water was found in the lateral ventricle of that side, in great quantity.

You see, indeed, in the Sepulchretum (*y*), that compression of the brain from water was often observ'd in those, who had been affected with amaurosis, amblyopia, and blindness. Or if you should think, that you are not sufficiently satisfy'd by this reasoning, as you may possibly expect, that by reason of the water urging from above, whether the ventricles, or, what is very rare, certain oblong sacculi, are fill'd therewith, the nerves which lie under it, should appear depress'd, as they have been found in amauroses, from causes of the same kind, by those celebrated men Cheffelden (*z*), and Kalfschmied (*a*); do but attend to those frequent epileptic convulsions, which can so easily pervert the internal structure of both optic nerves equally, though this perversion will utterly escape the observation of the senses.

7. But you think, perhaps, that I have undertaken a very needless labour, by encounter'ing difficulties, and doubts, which could never have occur'd to you. For what if you are in the number of those, who think that the optic nerves are not only join'd one with another, but that the right and left are so blended together, as to make an injury, or compression, which happens above the place of their conjunction, equally common to both of the eyes? But if you suppose this, how will you say it happen'd, in the observation before mention'd (*b*), that the grievous kind of struma, which as it had arisen on the left side of the brain, ought to have equally hurt both eyes, yet was, at first, hurtful only to the left; but after that, as it also extended itself towards the right side, became injurious to the right also? "In the left " eye vision began to be obscur'd; and, after a month, also in the right." And moreover, what necessity, in fact, can there be for such a mixture, if, which you have even in the Sepulchretum (*c*), from Bartholin, "Vesalius, " Aquapendente, and Valverda have sometimes observ'd, that the optic " nerves remain'd divided, in their whole course;" and yet, that the man, in whom Vesalius saw it thus, as I have elsewhere observ'd (*d*), "had never " complain'd of his sight, and had even always had a very strong sight?" For Valverdu seems really not to have ascertain'd the fact in his cases; and our Fabricius, when he wrote (*e*), that these nerves did not decussate

(*u*) Epist. 9. n. 20.

(*x*) Obs. 18.

(*y*) Sect. hac 16. obs. 7, 9, 12, 15.

(*z*) Saggio delle Tranfaz. &c. T. 2. p. 2.

(*a*) P.ogr. cit. supra ad n. 5.

(*b*) In hac sect.

(*c*) Ibid. obs. 26.

(*d*) Epist. Anat. 16. n. 14.

(*e*) De oculo, p. 3. c. 11.

each other, as “ anatomy has sometimes afforded the most clear testimony, “ since they have been found, more than once, not join’d together, but sepa- “ rated,” may seem, perhaps, to Bartholin, in these words, to have refer’d to his own observations; though, to me, he seems to have meant no other, than the observations of those gentlemen. But the observation of Vesalius is of such a kind, as even of itself to shew, “ that out of such a number of “ advantages suppos’d from this conjunction, of whatsoever kind it may be, “ scarce any one is found, which can seem sufficiently probable,” as I have said in the same place. Nor do I yet retract my enquiry, notwithstanding I greatly approve the reason of that celebrated man Daniel Bernoullus (*f*), why these nerves, after they have join’d each other, are infected different ways; for it by no means necessarily requires, that they shou’d be join’d, much less mix’d, together; nor is the same observation of Vesalius repugnant thereto, but even greatly favourable, since though he describes, and delineates them (*g*), separate from each other, indeed, he nevertheless represents them curv’d in such a manner “ as if the nerves did not meet together, for “ the sake of a coalition, but that they might conveniently proceed through “ their foramen, out of the skull into the orbit: especially, as proceeding “ even in this course, they are not inserted into the middle of the posterior “ part of the eye.”

In short, purposely to omit other things, those four observations of Vesalius, Cæsalpinus, Rolsinc, and Chesselden, which are commended by me in the same work, by no means agree with this mixture; which observations Santorini may seem to have forgotten (*h*), when he gives his own, that was similar to them, in such a manner, as if he thought that then, for the first time, the controversy was determin’d, from this circumstance, that the optic nerve, which belong’d to the blind eye, as it was in the orbit; so in like manner, quite up to its origin, it was more slender, and discolour’d, and remain’d always on the same side. But, of how much weight, in that controversy, observations of this kind are, they, whose hypotheses are contradicted thereby, shew, when endeavouring to defend their hypotheses, they do not put the facts sufficiently beyond a doubt; as for instance, Cæsalpinus (*i*), who, to say no more, supposes, that in the hemisphere of the brain, which he neither affirms he had seen, nor the others, whom I have mention’d, saw; nor indeed, as the causes were different, could they see; for I seem, to myself, to have answer’d some of the more modern ones sufficiently, in the eighteenth of the *Epistolæ Anatomicæ* (*k*). Yet I have there ingenuously confess’d, as it became me to do, that being very desirous of repeating an observation of this kind, and as I could not do it on a human subject, by reason of the brain having been buried before, having, at length, made the experiment on a dog, that I had perceiv’d the distinction of the nerve, which went to the blind eye, quite to the conjunction, but from thence, upwards, could find out no difference at all, and that I had refer’d the reason of this circumstance to the blindness not having, perhaps, yet continu’d long enough. But though from that time I pass’d by no occasion of investigating the subject,

(*f*) Comment. Acad. Sc. Imp. Petropol. t. 1.

(*g*) De corp. hum. fabr. l. 4. c. 4.

(*h*) Obf. Anat. c. 3. n. 14.

(*i*) L. 2. Quæst. Med. 10. (*k*) N. 40.

and happen'd to light on two, the same infelicity still follow'd me; as you will understand from these observations, which I shall immediately subjoin.

8. A certain man, who came from Tuscany, and who was almost destroy'd by a very large and foetid ulcer in his leg, being for that reason receiv'd into this hospital, died about the middle of January in the year 1740.

I had begun to dissect the head, on account of other enquiries, when I perceiv'd, that the man had been blind in one eye; but from what cause, and how long, because, as I said, he was a stranger, I could not learn. You will conjecture, from the description of the eye. The left eye was found; neither did the eye-lids of the right eye, which was in a very bad state, nor any part of the face, or head, shew any trace of a foregoing wound, or ulcer. But there was much fat in the orbit, as there generally is, with muscles which were pale indeed, but by no means shrunk, or extenuated. And the eye, being contracted into itself, was less even, in a very great degree, than the left. The anterior surface of it was white, without any traces of the cornea; and was divided into three little prominences, in such a manner, that you would suppose it had been formerly cut into three different sections. These prominences, and the other surrounding parts of the globe of the eye, and even by far the greatest part of the substance of the eye, were made up of the tunica sclerotica, which was harder and thicker than it us'd to be, in consequence of its being contracted into itself. The sclerotica also included the choroides, which was equally contracted, and was even at that time moist; but there was nothing besides this; so that all the other coats, together with all the humours, seem'd to have been formerly entirely consum'd, or press'd out. In the mean while, the nerves being laid bare, not only in both orbits, but within the skull also, although no difference appear'd between the motores oculorum, yet the greatest difference immediately appear'd between the optic nerves. For as the left, in like manner as its eye, was very sound, the right, on the contrary, was cineritious, and extenuated to a very great extent. And in the first place, indeed, from the eye to the breadth of a finger, or a little more, it contain'd nothing of a nervous substance, but only a cineritious, turbid, glutinous, and thickish humour; which being squeez'd out by a slight compression, the cavity was left empty; so that the coats of the nerve seem'd now to be the coats of some canal; and they were, as in that man whom I spoke of a little before (*l*), become much thicker than usual. But from that place they began to contain a substance, which was pretty firm, yet of a cineritious colour; which colour the nerve preserv'd, both inwardly and outwardly, and with it an evident slenderness, so far as till it came very near to the place where it was join'd with the left. And then, suddenly, all difference betwixt one nerve and the other vanish'd away; so that the right was now perfectly like the left, both within and without, before it reach'd to that situation where the two coalesc'd. And at this junction, not only upwards, ev'n to the origin, whether you examin'd the external surface diligently, or by accurately dissecting the nervous substance, as well that which join'd both the nerves together, as that which kept them separate and distinct, there was nothing, in either the one or the other, which

(*l*) Vid. Epist. Anat. 18. n. 40.

you would not, equally on both sides, acknowledge to be natural. And this I say, not only from my judgment, who dissected the subject, but from the judgment of all those who were present, and among these Mediavia; as also in a woman, who was dissected in the month of April, in the following year, and of whom I shall immediately speak.

9. I dissected the head of a woman, whose last disease, and the remaining circumstances that were found to be præternatural in her dissection, I shall write to you on a more convenient occasion (*m*). I saw the left eye to be not larger than that which I describ'd on the right side of the man, but somewhat less injur'd in its substance. For it had a cornea, and that not altogether opaque; although nearly in the middle, where, perhaps, there had been formerly a wound, or an ulcer; for I could not certainly know. It appear'd spotted and brown; in consequence of a portion of the uvea adhering closely to that very part of the cornea, and shining through, so as to resemble a greater disorder in the cornea, than what there really was. The remaining circumference of the eye was fill'd up by the tunica sclerotica, which was much contracted, and for that reason thicker, and contain'd the choroides, which adher'd thereto much more than was natural. But to the choroides was subjected a white, thick, firm, membrane, which, whether it was formerly the retina, or the vitreous coat, or both together, before it grew so thick, you will judge from hence, that it went forwards, covering also that part of the eye, where the corpus ciliare, and chrystalline humour, are wont to be: are wont to be, I say; for there was nothing in this eye, which could be certainly known to have been the chrystalline or vitreous humour, but only a few drops of turbid and brown water. Not far, however, from the natural situation of the chrystalline humour, I found a kind of hard little body, in its magnitude, and the form of its circumference, not much differing from the chrystalline, but a little larger, and convex on its anterior surface, being on its posterior concave; so that it represented a kind of little shield. It was made, in great part, of a pretty thick, bony, but not continu'd lamina, which I still preserve. Part of the remains of the uvea adher'd very closely to the anterior surface of that body; for another part, as I said before, was connected with the cornea. But the hollow surface of that body was invest'd by the same white membrane, which, as I told you just now, might be the retina, or vitreous coat, or both together, and left it to you to determine. As I trac'd the optic nerve from this eye, diseas'd as it was, to its very origin, I observ'd these things: It was more slender than the right; and when I cut into it, it was of a more compact substance, and brownish, as well in the orbit, as within the cranium; whereas the right nerve was in every respect natural, whether we consider'd its thickness, whiteness, or the mode of its substance. And this difference lasted to the conjunction: but at the point of conjunction, and above it, by whatever means you enquir'd, nothing but soundness could be seen, equally on each side.

10. What else shall I say here, except that less happy occasions have occur'd to me, of repeating the observations of Vesalius, than to others? If you allow of the dog, I have made the experiment three times; yet have I

(*m*) Epist. 15. n. 8.

never found any difference at the conjunction of the optic nerve, and still less beyond it: which as I saw so plainly beneath the point of coalition, why could I not equally have seen it above also, if there had been any? for that the three eyes, in whose nerves I enquir'd, were certainly as blind as it was possible for them to be, their description abundantly shews. But Cæsalpinus (*n*) saw it, as you have it also in the Sepulchretum (*o*), even in a man whose "sight was only weak;" and Santorini (*p*) in one, who, although he had been long blind, yet had "no conspicuous mark of disorder;" nor yet the man in whom Cheffelden made the observation (*q*), of whose blindness he happen'd to know nothing at all. Had the blindness, then, in all these instances, been of longer standing than in ours? For Vesalius observ'd it (*r*) plainly enough, even in the young man, whose eye had been pull'd out "a year before," by the executioner. Or, finally, can it be, that this circumstance is peculiar to the right eye only, since it has happen'd twice to Vesalius, once to Cæsalpinus, to Santorini, and Cheffelden, at all times, that they saw it obtain on the right side? But, besides that this supposition does not at all seem probable, was not the Tuscan also, of whom I have given you the account (*s*), affected in the right eye? Moreover, since the time that I wrote these things to you first, not only other opportunities of enquiry have offer'd themselves to me in this way, but it has even happen'd twice (*t*), in like manner, that although the right eye had been long blind, it was, nevertheless, utterly impossible to perceive any difference betwixt the right and left nerve, beyond the place of conjunction. Which I see, however, has been possible to others, in similar cases, besides those I have nam'd.

For lately, when I was looking after quite another thing, I lit on a passage of Heilandus (*u*), where he wrote in this manner of a person executed for the murder of an infant: "One eye had been depriv'd of the power of "seeing, the optic nerve being not only more flaccid, and less, than it ought "to be, but this difference being also observ'd, even beyond the usual combination in the fella turcica." Therefore, while we wait for a more happy occasion, also, let us, in the mean while, be content with the observations of others. Yet I am not altogether sorry for having made my observations: first, because they have taught us, that what occur'd to Vesalius, does not always, and even not very often, happen, in the blindness of one eye: and in the next place, because I found a bone within the eye, which is a circumstance that does not often occur; as we shall see in another place, where I shall write of a much more rare appearance, that is, of the retina being seen bony by me (*x*): but in regard to that little bone, of which I spoke just now, although it was hollow'd out in such a manner, and pretty large, yet it is not an easy question to determine, whether it was the anterior surface, and portion of that, which had formerly been the chrySTALLINE humour, that finally consists, in great measure, of fibres and membranes (*y*), and when macerated, is enlarg'd (*z*); or whether it was rather the membrane, or cap-

(*n*) Qu. cit. supra ad n. 7.

(*o*) Sect. hac obs. 17.

(*p*) C. cit. supra ad n. 7.

(*q*) Loc. cit. supra ad n. 6.

(*r*) C. cit. supra ad n. 7.

(*s*) N. 8.

(*t*) Vid. Epist. 52. n. 30. & Epist. 63. n. 6.

(*u*) Eph. N. C. Dec. 3. a. 7. obs. 157.

(*x*) Epist. 52. n. 30, 31.

(*y*) Vid. Epist. Anat. 17. n. 30, & seqq.

(*z*) Ibid. n. 32.

fula, thereof, push'd forwards, and become thicken'd, the humour itself being consum'd (*a*), I do not think myself capable of deciding: last of all, because, by this means, I have seen various constitutions of blindness in the eye, from various dispositions, and causes, which you may compare with others; either such as I have describ'd already (*b*), on other occasions, or shall hereafter describe (*c*); or those which you will read in other works, and especially in the *Sepulchretum*: as, for instance, when in a child (*d*), "all the humours of the eye were found to be converted into a sebaceous matter;" or when in beasts (*e*), "sometimes no humours are found, but the interstice between the cornea and the chrySTALLINE humour, is fill'd up by a kind of callous flesh, sometimes the chrySTALLINE is evidently connected with the cornea, and sometimes the albuginea appears indurated;" but especially where there was a blindness join'd together with the extenuation of the optic nerve.

II. And of this last kind, are those observations to which these arguments are prefix'd (*f*) "Blindness from extenuation of the optic nerves (*g*), amaurosis from the subsiding of the ventricles of the brain, and a wasting of the optic nerves (*h*), weakness of the sight in one eye, from an extenuation of that optic nerve (*i*), wasting and extenuation of the right eye, from childhood, by reason of the right nerve being more slender than the left, beyond the conjunction:" as if in these, which are mention'd in the first and the third place, there had not been an extenuation beyond the conjunction, as there certainly was; for those are the same that I have spoken of above (*k*), from *Rolsinc*, and *Cæsalpinus*, to whose purpose they would not at all have been suitable, if it had been otherwise (*l*). But who affirms for a certainty, that the wasting of the eye was to be accounted for from the extenuation of the optic nerve? *Bartholin*. But *Vesalius* says nothing of this kind, whose words are soon after subjoin'd in a separate place (*m*), as if he had been relating some other observation of that author; although he by no means gives you the whole of what he says upon the subject. And *Cæsalpinus*, and *Rolsinc*, do not mention even a word of the wasting of the eye. Add to this, another instance of silence, on a similar case, in *Rolsinc* (*n*): the case was of a woman, whose right optic nerve was wasted away "by a tabes;" so that the coats thereof coalesc'd; "and in that eye was an abolition of sight:" which observation he made at *Padua*. And even add that observation which I pointed out just now, in the third place, from the *Sepulchretum*, that was also made at *Padua*, by *Scultetus*, and in a woman: for it seems to me expressly to deny the extenuation of the eyes. "The optic nerves," says he, "gradually wasting away, (for in this case, they appear'd to be less by one half, than in others) an amaurosis, or gutta serena, was brought on the eyes, which were, on all sides, unhurt in their substance; for they had been hitherto well nourish'd, the veins and the ar-

(*a*) Vid. *Epist. Anat.* 18. n. 19. & seq. n. 38.

(*b*) Ibid. n. 28, 29, 38, 40, &c.

(*c*) *Epist.* 52. n. 30. & *Epist.* 63. n. 2. & seqq.

(*d*) *Seçt hac* 18. obs. 25.

(*e*) Obs. 19. (*f*) Obs. 3.

(*g*) Obs. 5. (*h*) Obs. 17.

(*i*) Obs. 26. (*k*) N. 7.

(*l*) Vid. *Epist. Anat.* 16. n. 14.

(*m*) Obs. 26. §. 2.

(*n*) *Disp. de Gutta Serena*, c. 4.

"teries being very natural and well constituted." And I, in like manner (*o*), in a dog, where one of the nerves was more slender, which answer'd to the blind eye, saw the eye "in a good condition, and of its natural magnitude, "and fullness:" and in this state did it occur to Cheffelden, and Santorini, in persons affected, as it seems, with an amaurosis also, as I just now hinted (*p*). And what will you say to this, that Rolfin (*q*), in order to shew, that the eyes are by no means nourish'd by the optic nerves, says, "If these are obstructed, whence comes the nutrition of the eye? and we see the eye, in "an amaurosis, or gutta serena, rather enlarg'd than diminish'd." And when you shall have consider'd all these things, you will be less averse to Abr. Vater (*r*), when he endeavours to prove, although from one observation only of Cheffelden, "that it is manifest, the atrophy of the eye, in one of the "examples of Vesalius, had not deriv'd its origin from the wasting of the "optic nerve, but from another cause." And indeed, if any one should affirm, that not even blindness itself, join'd with an extenuation of that nerve, is always to be accounted for from thence; but that rather, sometimes this extenuation succeeds to the blindness, either because the nerve ceasing long from its office, becomes wasted, as most other parts do, or because it is injur'd by deprav'd humours, returning from the corrupted eye, by the vessels which accompany the nerve itself, both internally and externally; I say if any one should affirm this, it is in nobody's power to refute him. For otherwise, how can the extenuation of the optic nerve be join'd, at the same time, with the corruption of the eye, which began from external causes? Or how could this extenuation be so evidently observ'd, by Vesalius (*s*) in that young man, whose eye had been put out a year before, by the executioner? I pass by that which I shall show on another occasion, by a double observation (*t*), I mean that the optic nerve is sometimes extenuated, and yet the eye that answers to it, which you will be surpriz'd at, is not made blind therefrom. Yet oftentimes this very extenuation of the nerve, or rather the disorder, of which this extenuation of nerve is the consequence, is the cause of blindness, as in the amaurosis, of which a few things remain yet to be subjoin'd on the present occasion.

12. And to omit this, that an amaurosis follows, when the optic nerves are corrupted; for it is both self-evident, and confirm'd by many observations in the Sepulchretum (*u*), but especially in the twenty-third; or when they, or their thalami, are affected by a purulent acrimony, which the observations of Brunnerus (*x*), and Laubius (*y*), jointly demonstrate; an amaurosis even follows, when either the nerves themselves are distracted, or some parts of the brain, which are subservient to them, are vehemently shaken and disturb'd. Which, I do not doubt, happen'd in two patients, that I have seen, and assisted, as far as any thing could be done, with my advice. In both their cases a violent blow on the head was the cause of all their misfortunes: and to both of them, from thence, yet not after a short interval

(*o*) Epist. Anat. 18. n. 40.

(*p*) n. 10. (*q*) Disp. cit. c. 3.

(*r*) Diff. qua Visus vitia duo &c. thes. g.

(*s*) Supra, n. 10.

(*t*) Epist. 56. n. 21. & Epist. 63. n. 8.

(*u*) Sect. hac, 13. 24.

(*x*) Eph. N. C. Cent. 1. obs. 69.

(*y*) Earund. Cent. 7. obs. 39.

of time, an amaurosis of both eyes had happen'd, when they were at Constantinople: at length, in both of them, when after some time they had return'd to their native country, in different parts, an apoplexy put an end to their lives, which confirms what I have already said. One of them was that knight, in whom I have explain'd so opposite effects, in the different muscles of the right and the left eye, from one and the same palsy (z), the Count Æneas Suardo, and the other was a very learned physician whom I have before commended to you (a), Francesco Spoleto (b).

13. Besides those causes of an amaurosis, which I have hitherto consider'd, do not imagine I shall also consider, that which is produc'd in the sixteenth observation of this section in the Sepulchretum, from Rolsinc. For I have pointed out, in another work (c), what he himself thought afterwards of his own observation, what others, and what I have thought of it, when, for instance, I made public my old observations; for I have a new one also (d) of the chrystalline and vitreous humours, being found dissolv'd into water. But whatever, at length, is the cause of the true amaurosis, as in this disorder the eye ought to appear to be rightly constituted, to those who inspect it, for which reason it is by some, as I said, call'd gutta serena, and by others, as by Rolsinc, in this very observation, the black cataract; it is very convenient for them, who for certain causes are audacious enough, sometimes to feign a disease, to pretend that they are seiz'd with this in particular, and impose upon physicians, even those of great name among the common people, as I have sometimes seen. But where there is any suspicion of fraud, nobody can be deceiv'd, except they who perhaps never observ'd, with Pliny (e), how rarely persons are to be met with, "who do not wink against any threatening of a blow, and how much difficulty there is in avoiding it." And I even remember, when in a dissembler of that kind, the state of the pupils being neither dilated, nor unmov'd, much increas'd my suspicion, it was sufficient just to move my fingers towards the eyelids silently, as if for the sake of more closely observing the disorder; for before I touch'd them, he immediately, and evidently, clos'd his eyelids, and thus, contrary to his own intention, discover'd his fraud. And I wonder that John Baptist Silvaticus should have omitted so easy and obvious a method, in his little book, which is entitled, "Of discovering those who pretend disease," and which is in other respects very useful, where he shews (f), "by what method a pretended privation of the senses, may be detected." For to place before the eyes the greatest splendors, which he himself seems to hint, is an exceedingly dangerous experiment, for this very reason, because by these, as he says, the sight "is not only troubled, but destroy'd." And I remember, moreover, that I found out by the same method, a man who pretended I know not what kind of fits, in which, he said afterwards to his friends and his physicians, that he was depriv'd of all power of feeling and moving; and that, at the very time I was bringing some severe remedies to excite him, with the

(z) Epist. Anat. 18. n. 6.

(a) Epist. super. 8. n. 9.

(b) Vid. Giornale de' Letter. d' Italia T. 12. Art. 13.

(c) Epist. Anat. 18. n. 38. 39.

(d) Epist. 63. n. 6.

(e) Natur. Hist. l. 11. c. 37.

(f) c. 11.

most cautious silence. For as he, by accident, kept open his eyes, in one of these fits of his, and I shook my fingers over them; immediately before I touch'd him, he plainly shew'd to all, who were present, by winking, that he could not only see, but could move his eyelids also.

14. I have made a long dissertation on the amaurosis, or black cataract. I will now make one somewhat shorter, on the suffusion, or that cataract, which, by reason of the colour of the pupil therein, being so far different from the black one, which is natural, is call'd, simply, the cataract; I say I will make a somewhat shorter dissertation. For that the cause of this disorder, though call'd cataract, is not an immediate defluxion of a thick humour on the eye, from the brain chiefly, as is contended for (g) by the words of Plempius in the Sepulchretum; and what truth there is, concerning the situation and nature of the cataract, or what truth there is not, both in the said observations of Plempius, and those many observations which are related from others, in that section, may be readily understood, not only from the writings of others, but from mine (h) also. And some things, in like manner, have before been pointed out by me (i), from which it might appear, when and how far, after the demonstrations of Chalesius and Pitcaru, or others, if you choose it rather, those things may have place, which are wont to be given out in the beginnings of a suffusion, as you see also in the Sepulchretum (k): "as long as gnats and atoms are observ'd, that this happens" from corpuscles swimming in the aqueous humour: although, at other times, I have not scrupled to declare, that these corpuscles may be some injuries in the last cells of the vitreous humour, at other times, in the optic nerve, and the tunica retina, which impose upon you for gnats, or specks, and by what method, the various situation of one, or the other, is to be distinguish'd: and if among these injuries, you place the disorders of the vessels, that are interwoven with the retina, swelling præternaturally here and there; you will do right, so that you do but acknowledge, there may sometimes be other causes besides this.

And I would have you consider attentively, over and over again, even those few words which I have thrown in, as it were, by the by, among my observations of the aqueous humour under the chrySTALLINE coat (l): "I suppos'd, that the secretion of this humour being obstructed, the chrySTALLINE was made dry, and opaque, almost as it happens when the chrySTALLINE is extracted, and dried." And do you think that what I have written is repugnant to truth? And what you can believe, as some relate who treat of the cataract, of which I do not make the least mention in that place, was "refuted" in particular by Petit the physician, who you know very well taught the same doctrine that I had taught twelve years before (m). "The chrySTALLINE," says he, "cannot grow dry, as long as it is moisten'd by that aqueous liquor; yet no sooner is this fluid deficient, than it becomes dry, hard, and opaque." Truly I could not have conceiv'd, if he had

(g) Sect. hac 18. Schol. ad Obs. 20.

(h) Epist. Anat. 18 & 19.

(i) Advers. Anat. 6. Animad. 75.

(k) Sect. cit. Schol. ad obs. 22.

(l) Adverser. indic. Animad. 71.

(m) Memoir. de l'Acad. R. des Sc. A. 1730,
Mem. de la Capsule du Cristallin.

not refuted himself at the same time, how he could have been able to refute me therein. For which reason, I the more willingly read over the letter (*n*), which came at length into my hands, being publish'd against Hecquet, and in which he was said to have done that. You ask me what I thought of it: he set forth my opinion; in regard to his own, which was entirely the same, he was silent! But what did he at length object? why such things, that if they had been objected to him, he would have answer'd, by saying, that they did not contradict his opinion, inasmuch as it was propos'd, where the question was not at all of the cataract, as if I had treated of this disorder, where I propos'd mine. And if I had, I confirm'd my opinion by his consent being superadded (*o*); but nine years after that letter, his letter was publish'd, nor did I pronounce universally, on that cause of the cataract, as he did presently, in the same letter, on the cause of the amaurosis; but after having given this opinion among many others, I expressly profess'd, in regard to all, "that I affirm'd nothing, but only made some conjectures (*p*)."
Wherefore, when he sent that letter, he had no reason to make this objection, that he had never seen the chrySTALLINE humour affected with a cataract, in the dead subject, where the aqueous humour was wanting; for I could not only with truth deny, that I had spoken of the cataract, but Hecquet, whom he urg'd so violently, if he had liv'd longer, might have answer'd also, that neither had sanguiferous vessels ever been seen by him, in any chrySTALLINE humour (*q*), which not only the excellent anatomist Winslow (*r*) has shown to have been sufficiently seen by him, but so many other illustrious men, commended by the very ingenious Zinnius (*s*), who himself saw them, have seen them; and on the other hand, that those twigs, which Petit (*t*) had taught, without any doubt, were added to the ciliary nerves, from the sixth pair, and went into the interior parts of the eye, could, as the same most learned Zinnius (*u*) says, "be confirm'd by no researches of the more " modern anatomists."

But to leave Hecquet, and return to myself alone; I certainly did not propose a conjecture, of the *total* defect of this aqueous humour, but concerning its diminution only, not even when I ventur'd to suppose, that hereafter from that opinion of mine, one cause of a cataract, among so many others, might be argued: and that this diminution has been seen in that disease by him, Petit certainly has not denied; nor indeed if he had, could he have done it justly, because, even in sound eyes, so much of this humour is not always found, and even is frequently in so little quantity, that it seems to be wanting: for which reason, as you would believe in some, that it was pretty naturally diminish'd, so, on the contrary, you may think, that in others it is not diminish'd, and yet in both cases judge wrongly. But what will you say, when I tell you, that Petit himself has presently added that which he had also confess'd before (*x*)? I mean, that cataracts, however, were not wanting, in which the chrySTALLINE humour, by reason of the total defect

(*n*) Lettre II. sur les maladies des yeux.

(*o*) Epist. Anat. 18. n. 16.

(*p*) n. 17. (*q*) Memoir. cit.

(*r*) Expos. Anat. tr. de la Teste n. 301.

(*s*) Descript. Anat. Ocul. hum. c. 5. § 4.

(*t*) Mem. de l'Acad. R. des Sc. A. 1727.

(*u*) Descri. cit. c. 9. § 8.

(*x*) Mem. cit. A. 1730.

of this watry latex, has become so dry, that it might be rubb'd into powder, as he has found it in many bodies : so that, if I had said in the *Adversaria*, that the same thing sometimes happen'd, he certainly could not have refuted me.

You see, then, to what his refutation of my opinion amounts ; so that I am almost ready to believe, he did not so much intend to refute it, as he wish'd to be thought to do so. Nevertheless, as he is said to have done this, in more than one writing of learned men, that have been publish'd, and to have denied, what you see it was impossible for him to deny, I judg'd for this reason, that it was necessary to reply to it here, lest you should, perhaps, suppose, that I neglected the authority of a man, who, when living, was so deserving in anatomy, that I very willingly go on to revere his memory, when dead.

But to return to my *Adversaria* : I did not finally omit this circumstance relating to the suffusion (*y*), that from the light we see, when the eye is press'd, I endeavour'd to deduce a mark of the retina being not diseas'd : which knowledge, as it is necessary in the greatest blindness that a suffusion, or occlusion, of the pupil brings on, before we attempt a cure, so perhaps, without this experiment, cannot be sufficiently attain'd : concerning which subject, I greatly desir'd to read the opinion of that excellent man, George Augustus Langguth ; as in that dissertation (*z*), which he wrote on the same light, he has not only confirm'd my other experiments, in the most courteous, and obliging form of words, but has also prov'd them by his own experiments. For as to those experiments, which have answer'd in the same manner to both of us, and that in particular, which he was willing to repeat with a friend ; if you undertake to explain them, not in general, but in particular, you will perceive, without much difficulty, to the opinion of which of us they are the most simultaneous. But this being equally laid aside here, as in the *Adversaria*, if you attend only to the experiments, which every one may easily make upon himself ; I do not doubt, but if any person comes to you, to be cur'd, who was blind from his birth, or from congenial suffusions, or a privation of the pupils, you would previously examine, by so speedy, and so harmless an experiment, whether there was any reason to expect a cure : unless you, perhaps, think, that in eyes of this kind, although the optic nerve, and the retina, be sound, no sense of light is excited from pressure ; because you have, perhaps, heard those who have been cur'd, deny, that they had any idea of light before, though it could scarce possibly happen, that the eyes had never been press'd upon, or stricken, though against the will of the patient. But nothing forbids your trying, as I said before, if it were only to determine, whether they could at all deny it with truth, or how far they might deny it : but in others, who have been blind long indeed, yet not from their birth, I do not see that there can be this doubt. But in both the one and the other, there will be, perhaps, that one doubt, which I afterwards pointed out in the *Epistolæ Anatomicæ* (*a*) ; although this does not very easily happen, by reason of the rare conjunction of the disease.

(*y*) *Advers.* 6. *animad.* 73, & 74.

(*z*) *De luce ex pressione oculi.*

(*a*) *Epist.* 19. n. 9.

But to return thither, at length, from whence my discourse on the cataract began: As you may read elsewhere, not only most of those things that I have mention'd here, in a hasty manner, but also the observations of Val-salva (*b*) and mine (*c*), on the suffusion; I shall merely give you here what I have since seen, that are to be referr'd to the same disorder, first in a man, and then in a woman.

15. A builder, or mason, as they are commonly call'd, being sixty years of age, had now, for a long time, scarcely discern'd any thing; but what he did, was laterally, and when the sun was bright only. He having died of some disorder or other, in the month of February, in the year 1740, when I was teaching anatomy publicly, his head was brought into the theatre. As at that time every thing was stiff with the very severe cold, which you still well remember, so that the necessary dissections could hardly be perform'd; the dissection of this head was put off many days, even to that time, when, about the end of the month, the cold had very much remitted. Why I mention'd these circumstances, you will see presently.

The head, first, shew'd many scars in the skin of the sciniput, and occiput; for the man had formerly fallen from a great height. But although, when all the involucra of the skull were taken off, the external surface of it under the cicatrices was somewhat white; yet the internal surface, and the contents of the cranium beneath, were unhurt, except that the cerebrum was altogether rigid and hard; and the water, which had fill'd the lateral ventricles, was found to be so condens'd by the frost, that being laid hold of with the hand, it all follow'd at once, and retain'd the form of the ventricles; just as wax, which is melted and injected into any cavity, may be taken out after it is become cold. And yet the cold had now remitted more and more, for many days, and the head itself had always been not far from the fire; and even more than once, when they had suppos'd that it would soon be dissected, but on that day, particularly, when it was at length dissected, it had been plac'd much nearer to the fire. And this circumstance, which I never saw but at that time, I, who am an Italian, was willing to mention here to you, who are an Italian; although Schneider has not omitted to mention, that even in Germany, in a winter which was much harder there than it us'd to be, in the open road, and in the head of a young boy, the same thing had happen'd to the brain, and the little moisture which was contain'd in it; as you will also see in the next and seventeenth section of the *Sepulchretum* (*d*). And this I have written, in order to inform you, that the head was not only kept many days after death, but was congeal'd frequently by the cold, and thaw'd again by the heat; so that when we came at length to dissect it, the eyes were flaccid and shrunk in their substance. From which this inconvenience also happen'd, that induc'd anatomists formerly, as they were us'd to dissect the eye the last of all the parts of the body, and therefore of course, when flaccid, to give less room to the vitreous humour than it has naturally, and in a fresh body, and to place the chrySTALLINE almost in the very center of the eye; for so it appear'd to me, when I dissected one eye on the fore part, for which reason I

(*b*) Dissert. Anat. 2. n. 15. & seq.

(*c*) Epist. Anat. 18, & 19.

(*d*) Obs. 1. § ult.

began the dissection of the other behind: but I do not think there was any other obstruction of consequence to our observation. For in the first place, I saw the optic nerves very plainly, both within and without the skull, entirely similar to each other, and like to found nerves, unless that in the orbits, when we cut them across, both appear'd, in like manner, cloth'd with thicker coats than usual. I also found both the cornea, and the sclerotica, to be without any traces of a cicatrix. And, not to use many words, the whole of the disorder was found to exist in the chrystalline humours, if you except a kind of lensor in the vitreous humour, by which it adher'd to the fingers, and form'd itself into long threads, following the fingers as they were drawn asunder: and what prevented me from attributing this altogether to stagnation, and the other causes which I mention'd before, was the difference that I found betwixt the lensor of one eye, and of the other. For that was the more viscid, which lay round the chrystalline, that was of a dirty yellow colour, but less yellow on the surface; and it was also the softer of the two; and even the nucleus was not hard. But the other chrystalline was made up of a whitish substance in the circumference, though in the middle it was brown; and this brown substance came from the medullium to the middle of both surfaces, being softer than the whitish substance, which, however, itself was not hard. Besides, this whole chrystalline was not only much less thick than naturally, but even, at one side of it, was deficient in a part, and that no small one; so that it was not circular in its circumference. Nor did I find any thing else præternatural in either of the eyes.

16. If it had been possible to know for certain, whether the little sight which the man had, as I have already said, was from both eyes, or from one only, and on which side it was; it would have been more easy to say, whether he saw for this reason, because the circumference of one chrystalline humour was of a more diluted yellow, or because that opaque part of the other was wanting on the side. But this question being now left undetermin'd, I will say that which is certain, to wit, that the chrystalline, which I describ'd in the second place, was much more morbid in its condition than the other, inasmuch as the whole of it was more opaque and softer in that part, where it is wont, especially in old men, to be harder: besides, it was more slender than it ought to be naturally, and more than that, mutilated. But did this happen, because the same disorder had attack'd that part, which was wanting, but more sharply, which had also made the middle part of it more soft than it ought to be, and of a brown colour, that is, half-corrupted? There was nothing of this kind in the other chrystalline; but the yellow colour, with which it was ting'd, is often observ'd in old men, and in that part especially, where it was found in this chrystalline (*e*): although that it was far less dilute here, the obstruction of vision, in the manner I have said, in this eye also, sufficiently demonstrates. But the two circumstances, which I have observ'd in the former mutilation, and an internal brown colour, are of such a kind, that you have an example of the first in an observation of the celebrated Morand (*f*), who found the chrystalline humour, although not

(*e*) Vid. Epist. Anat. 18. n. 26.

(*f*) Mem. de l'Acad. R. des Sc. a. 1730.

less hard than the hardest stone, worn away nevertheless, in a manner, at its upper edge, and even, as the figure thereof shews (*g*), deficient, in one place particularly; and that not from the surgeon's needle, to which the man, like ours, had always been extremely averse. And I will give you an instance of the colour being not only brown internally, but also black, on another occasion (*h*).

17. I order'd the eyes of an old woman, concerning whose last disease, and dissection, I shall write to you at another time (*i*), to be taken out, and brought to me, as I found she had been blind. Cutting into them, I perceiv'd no disorder at all in one of them, except opacity in a part of the cornea. But the other, although it had most of its parts in good condition, nevertheless shew'd the chrystalline humour to be so much diminish'd, according to all its dimensions, that scarcely any part of it was remaining; and what did remain was white and opaque, although internally it was even then moist. It also adher'd with the iris to the cornea; in which place the cornea was more opaque, and somewhat hollow'd into a foveola, or little cavity, of an elliptical circumference, and ting'd with a dirty yellow: but this disease's appearance did not reach to the exterior surface of the cornea.

18. It is probable, that these disorders are to be imputed to an internal inflammation of the eyes, which had, perhaps, preceded. This, however, is certain, that, besides the opacity of the chrystalline humour, in which the nature of the suffusion generally consists, a consumption also of a great part of it, and an unusual, and even immoveable situation, had happen'd both to this, and to the iris.

But neither in this woman, nor in the mason, whom I spoke of above (*k*), were dryness and hardness join'd with an opacity of the chrystalline; so that Valsalva would very readily have call'd all these cataracts (*l*). But that cataracts of this kind come more slowly to their real maturity, I do not doubt; of which kind, I see, was one of the two, that manifested themselves in the eyes of that woman of the first rank (*m*), within a few years, in which I had formerly seen kinds of striæ, or lines; and that the other was of this kind, I always thought, and still think. For the one, from the very time that it first discover'd itself, by a kind of whiteness, in a certain part of the chrystalline, remain'd just in the same state, for many years, without the least sign of increase. But as to the other, which had made the whole chrystalline, in fact, white, and yet had not render'd it so opaque, as was to be expected in so long a space of time, and as it should have been, when others did not dare undertake to disturb it; some stranger or other, who was a great boaster, and who, as Cicero says (*n*), *properaret, cui fora multa restarent*, "who was "in a hurry, having a great deal of business to do," without the knowledge of any of the others, immediately depress'd it; not so much, however, but that, after some time, a white opacity again appear'd behind the pupil, not indeed to so considerable a degree, as that which is mention'd on another occasion by me (*o*), as having happen'd in a noble virgin, but such a one, ne-

(*g*) Plag. 28. litt. D.

(*h*) Epist. 63. n. 6.

(*i*) Epist. 35. n. 12. (*k*) N. 15.

(*l*) Vid. Epist. Anat. 18. n. 27.

(*m*) Ibid. n. 19.

(*n*) Orat. pro Cluent.

(*o*) Epist. modo indic. n. 22, 23.

vertheless, as testifies the method of cure, and even makes it, to be entirely unsuccessful. But it was not thus with another, who was a sister of that matron, as in her the suffusion was depress'd, when it was come to its maturity. Yet in the third sister, in whom the same stranger had depress'd the cataract, the marks of an unsuccessful method of cure were much sooner discover'd. You see, that there were in this family three sisters, and that all of them were subject to the same disease; with which not one of the three noble brothers was, in the least, afflicted. So I shall tell you, on another occasion, of a family, in which the females, who were born of a deaf mother, were all deaf, but none of the males (*p*).

The mention which I have now made of this noble virgin, brings to my mind, what was the opinion of that celebrated man, Gunzius, in a little book, that was publish'd at Leipzig, while he was president, and which certainly deserves much praise, concerning my observation on her eyes. This book came out in the year 1750 (*q*): and therein he thought the observation to be so far rare, that notwithstanding there are so many spoken of in that little work, yet, depending upon this alone, he constituted a new kind of suffusion. And, indeed, when I came to consider the subject, in every point of view, I hinted that it might possibly happen (*r*), that "hence even a species of suffusion was to be allow'd on the outside of the chrystalline humour, and its coat." But I did not think the observation was "so rare;" nor was I willing to determine, in the least, as I have once and again expressly said, from what it happen'd, without other opportunities of distinctions of the like nature, which at present I was without; since I was neither ignorant myself, nor conceal'd from my readers, that whatsoever I might conjecture on the subject, would be liable to considerable causes of doubt, which did not escape me. And I hop'd, indeed, that in the mean while, somebody would arise, who should remove these causes of doubt from me. But, as the old man says in Terence (*s*), now *Incertior sum multo, quam dudum*, "I am more at a loss than ever." Nor did I "suppose," but only propos'd for enquiry, whether the chrystalline coat could possibly have continu'd to separate that glutinous matter; and I myself argu'd against that very supposition, by many different reasonings, and, in particular, made use of those arguments against it, which, to my great surprize, are now objected against me (*t*). And I even said, it was worthy of enquiry, whether this matter, being perhaps dispers'd through the aqueous humour, could possibly have agglutinated itself afterwards to that coat. And as I had likewise admonish'd, that we ought to have some doubt upon this head, especially as such a supposition could by no means have taken place, without its being agglutinated to the iris also, and to other parts; I should never have expected, that, among other things, this answer would have been made me: That the coat of the chrystalline, "when a man goes to sleep, at which time the viscous particles can subside, more than at any other time, is certainly the lower part of the eye:" as if the iris, even at that time, were

(*p*) Epist. 48. n. 48.

(*q*) Animadvers. de Suffusion. natura, & curat. c. 1. § 15.

(*r*) Epist. Anat. 18. n. 24, 25.

(*s*) Phorm. Act. 2. Sc. 4.

(*t*) C. 1. cit. § 6.

not inferior to the greatest part of the aqueous humour, as also that side of the cornea, to which the head, while we sleep, is perhaps inclin'd. Nor are the doubts only not taken away by this reasoning, but are even still more increas'd by these words: "That this viscid matter was from the aqueous humour, I so much the less doubt, as it is very certain, that the fluids of our body, and especially those which are not continually mov'd through the vessels, very often acquire a viscid disposition." But I doubt, in the first place, whether this humour be not mov'd, as much as is requisite, by the vessels which are continually conveying it, and by the very frequent agitations of the iris, and eye, to prevent it acquiring a viscid disposition: and in the second place, I doubt, whether it does often acquire this viscosity, since it is certain, that viscid suffusions are not often found therein. And, indeed, out of the few of this kind, which I had pointed out, that taken from Wepfer, it is thought, should be transferr'd from the aqueous to the chrySTALLINE humour; although the author has said, that the mucous matter was not within the coat of the chrySTALLINE, but cover'd it, and yet not all round about, though he uses the word *circumcirca*, I suppose, by accident. Other things I omit: for it ought to be enough for me to have consider'd, without slander or revilings, whatever may have been urg'd against me without slander or reviling, and from a desire after truth. And I, moreover, very cheerfully and readily affirm, that this little book is in the number of those few, which are written learnedly, methodically, and clearly, on the subject of suffusion. And as almost all the examples of this disease, that are extant among approv'd authors, are taken notice of in this work; so there is none of them, that is not refer'd both to a certain genus, and to a certain species, the signs by which they are to be distinguish'd not being omitted, and the methods of cure being pointed out, and these not only argued from the advantages of the good method, but from the mischiefs of the bad.

But as I have said, that almost all the examples were already produc'd, you will, perhaps, ask me, then, what are still wanting; for which reason, I will not conceal those that occur to me, as I write. That very excellent man, Burc. Dau. Mauchartus (u) asserts, that he found a membranous, solid, fibrous, whitish cataract, in each eye of a dog, when at the same time the aqueous humour, through both the anterior and posterior chamber of which it was extended, and the other humours, were pellucid. And the same Mauchartus, together with another very eminent professor, John Zellerus, saw a thin and blackish pellicle, plac'd in such a manner before the pupil of each eye, in a woman, that it firmly adher'd to the cornea, near its internal circumference. Nor was the eye without those disorders of the vitreous and chrySTALLINE humours, which are mention'd by the celebrated Keckius (x). The skilful anatomist Jo. Christoph. May (y), in a woman, whose cataracts had been formerly depress'd, the one with success, and the other without, describ'd the former of what kind it was, and where he had found it; but instead of the other, he found, as he thought, the anterior surface of the coat of the chrySTALLINE, not as in the first eye, pellucid, and in a natural

(u) Synechie, §. 8.

(x) In Præfat. ad Dissert. suam de Ectropio.

(y) Commerc. Litter. a. 1733. hebdom. 4. n. 3.

state, but very thick and opaque. And the celebrated Trew(z) has told us, what difference there was, betwixt the chrySTALLINE humours of an aged man, in one of which, was an incipient, and in the other, a perfect cataract. Nor do I doubt but my *Epistolæ Anatomicae* will also furnish you with some other example. For certainly, beside the great number of observations which are already taken from them, they have one also (a), that is describ'd somewhat more at large, of a membranous cataract in a woman, from the celebrated Balth. Walthieri, which, as I have there hinted, is also describ'd by the famous Royal Society at London. And do not be surpriz'd, that I have mention'd promiscuously, as they now come into my mind, examples of this disorder, whether in men, or in dogs; for we all use promiscuously also, those instances that are taken from the quadruped kind, especially if they have any thing peculiar in them, as in the observation of Mauchartus, a cataract is shewn to have exist'd, even in the first chamber of the aqueous humour, which happens extremely rare: and to this, for the same reason, I would have you join the observation of Sprogelius (b), because it demonstrates, that at the same time, in one certain dog, by way of a rare instance, the chrySTALLINE humours were both dried up, and opaque, and the vitreous humours without moisture, and corrugated, while the optic nerves were reduc'd to the thinness of a small thread, and that there were other things beside these of a peculiar nature. But that I may not say more of the sufficiency than of the amaurosis, let us proceed to the other disorders of the eye.

19. Concerning the myopia, or purblindness, however, and the disorder diametrically opposite thereto, it is sufficient to put you in mind, that it would have been better, nothing had been propos'd in the *Sepulchretum*, than that (c) which you will read there, and had been long ago rejected by Plempius (d). Platerus, indeed, who was an ingenious, and at that time, a learned man, and who, if he did not first demonstrate with justice the use and office of the retiform coat, and especially of the chrySTALLINE humour, as some think, was certainly, however, very near to the truth. Yet, as if it had fall'n out by chance, in those observations which he wrote afterwards, he was not altogether consistent with himself, and certainly suppos'd such things, concerning the seat of the chrySTALLINE, in those who labour under a true myopia, which agree with the contrary disorder, and *vice versa*: wherefore the true cause of those disorders, which in fact is accounted for, in the former, from the greater distance of the chrySTALLINE and retina, and from the lesser distance of these two parts in the latter, was unknown to Platerus, contrary to what others imagine. But as to the causes, which depend upon other circumstances, as for instance, on the chrySTALLINE being more or less convex and dense; these are not so much as mention'd in the *Sepulchretum*: although these, as well as the former, may be cur'd, and by the use of concave or convex glasses; so that I wonder a certain great man should suffer such a sentence to escape him, "that these disorders," to wit, "of a more dense, or lax chrySTALLINE, do not admit of a cure from glasses."

(z) Ejsd. Commerc. A. 1745. Hebd. 36.

(b) Eph. N. C. Cent. 7. obs. 71.

n. 3.

(c) Sect. hac 18. Append. 2. post obs. 33.

(d) Epist. 18. n. 20.

(d) Ophthalmogr. l. 4. probl. 39.

Finally, in the Sepulchretum by the word *nyctalopia*, is intended a disorder, opposite to the *myopia*, as we see it in many old men, which for that reason Scheidius, with justice thought, might be call'd the anti-*myopia*, as he tells us in that learned and ingenious dissertation, which is entitled, *Vifus Vitiatuſ* (e). But although that *nyctalopia*, which the more modern Greeks intended (f) may seem to be somewhat less different from the disorder, which is diametrically opposite to the *myopia*, as the *myopia* is from what Hippocrates understood thereby (g); yet these disorders are very far different from the *nyctalopia* of one and of the other, and proceed from very different causes; for which reason they do not admit of a cure by glasses; for what can glasses do towards the cure of the first, that is an evening blindness, which may seem to arise from a kind of resolution of the retina, or to the cure of the second, that is the blindness by day, which is probably owing to a too great tension of the retina? Therefore, as you distinguish them by this mark, that is drawn from the inutility of glasses, so it is necessary that you distinguish the *nyctalopia* by name also, from those two disorders. But to which cause of the *nyctalopia*, the cause of certain dullnesses of sight, arising from disorders of the retina, approach the nearest, you will also conjecture from hence, that a bright light is troublesome to the latter; but to the former is useful, just in the same manner as great sounds have been useful to those who are deaf, or have some difficulty of hearing, on account of a laxity, as Holder (b) and Willis (i) have affirm'd in their writings. And as with some of all the disorders which have been mentioned, the dilatation of the pupil is frequently join'd, as an effect with its cause, and with others a constriction thereof; take care, lest you pronounce that the cause of the disorder, is then in the surrounding iris; and in like manner, when some marks of a beginning opacity, in the chrySTALLINE, or any other humour, discover themselves: but when you shall have well weigh'd all the symptoms, which have preceded, or attend the disorder, accurately; then judge of the causes which produce those effects in the pupil. But if you read what Mauchartus (k) has publish'd, concerning the morbid dilatation of the pupil, or concerning the adhesion of the iris to the cornea; you will find many things that may be useful to you, both in your studies and your practice.

20. Concerning those things, in like manner, which are produc'd in the Sepulchretum, either of the pain in the eye, or its prociDENTIA, or strabismus, I will only just hint these few things. In regard to the first, that either the twenty-ninth, or thirty-fourth observation, ought to have been omitted. For you will easily see, that both of them are the same, in like manner as the beginning of the Scholia, to the first article of the first observation, is the same as most of the words which are soon after repeated in the second article of that observation. But concerning the prociDENTIA, that which Plempius (l) had copied, almost word for word, from our Spiegelius, though he suppress'd his name, and which you will read subjoin'd

(e) Sect. 1. n. 32.

(f) (g) Vid. apud Plenp. Ophthalm. l. 5. c. 26.

(b) Aët. Philof. Soc. R. in Angl. A. 1668. Ms Maj. n. 1.

(i) De Anima Brutor. c. 14.

(k) Dissert. de Mydriasi, & Diss. de Synechia, &c.

(l) Ophth. l. 5. c. 32.

to the twenty-fifth observation, certainly is by no means necessary, in a slight prolapsus of the eye, or rather in a not very immoderate prominence of the eye, without the orbit; for the optic nerve is not naturally tense, within the orbit, but so lax, that it may follow the eye, as far as I have said, without being at all broken through. But as to that which is added to the twenty-seventh observation from Hildanus, explaining a kind of prociencia oculi, which had at length been the consequence of a wound, inflicted upon the eye-lid, and ill cur'd, it cannot be easily prov'd, unless it be explain'd in a very different manner from that in which he explain'd it. For although it is credible that the wound penetrated into the right frontal sinus: yet that the whole eye was infected, from the putrefied blood of that sinus, "penetrating by the natural foramina, that go from those sinusses to the eyes," who can grant, unless he who does by no means doubt, but those things which he had touch'd upon a little before (*m*), concerning these kind of foramina, according to the opinion of some, were in every respect consentaneous with anatomy? If Hildanus had written, either in this place, or any other, which I am not aware of, what event a disorder of this kind had terminated in; it might then have appear'd, whether a caries did not rather open a way for itself, and for deprav'd humours, through the bony partition, which lies between that sinus, and the eye, and by this means penetrate into the orbit.

Finally, of the strabismus one observation only is propos'd (*n*), and that of one eye, the cause of which is suppos'd to be "from a great quantity of moisture washing the brain with which the nerves, call'd *motores oculi*, being impregnated," were convuls'd. And this cause being suppos'd without any additamentum, how can we account for the strabismus not having affected both eyes equally? But in the scholium which is added, indeed, other causes of strabismus are mention'd from our Saxonia, to wit, "a bad situation of the pupil or the chrySTALLINE." But many others are at the same time pass'd by. Nor, indeed, do I speak of internal causes only, as for instance, if the chrySTALLINES are in both sides rightly plac'd, and in one eye, that part of the retina does not answer to the pupil which ought, but another, and plac'd much nearer than is natural, to the part of the retina that is always blind, the situation of which is at the very insertion of the optic nerve, so that unless the muscles should draw it a little to one side or other, part of the image which is painted in the retina, would fall upon that blind spot. But I speak of external causes also, which are on the outside of the eye, and these of different kinds. For a strabismus may happen, not only from a convulsion of some of the muscles of the eye, but even from a palsy thereof likewise; which cause, the author of the *Finitiones Medice*, that are ascrib'd to Galen, long before Plempius, had taught. "The strabismus," says he, "is a resolution, not of all the muscles of the eye, but of some only; for which reason the eyes are drawn upwards, or downwards, or to one side." But a strabismus also happens sometimes, from any one of these muscles, being impregnated with humours, not freely circulating through it, as I saw happen in the wife of a lawyer, who was my

(*m*) Vid. Cent. 5. obs. 1.(*n*) Obs. 37.

friend : this woman having a humour settle, as the vulgar phrase is, at one side of the root of the nose, and the parts in the neighbourhood thereof, was seiz'd with this disorder of the eye, of which I cur'd her within a little time, when I practis'd physic in the place of my nativity. A noble priest had also been troubled with defluxions, or humours, for some little while, sometimes in one cheek, and sometimes in the other, when he was suddenly affected with this kind of depravation in his sight, that when he bent his eyes downwards to read, as our custom is, all the letters appear'd to lie one upon another, and in a manner to decussate each other, so that the whole was confus'd ; but this confusion was immediately taken away upon shutting one or other of his eyes ; or if he plac'd the book directly opposite to both his eyes when they were open indeed, but not cast downwards, and even, if he pleas'd, when they were turn'd upwards. Yet some confusion still remain'd, if the book, thus plac'd, was transferr'd a little to the right side, but not if it was remov'd to the left. I was consulted upon this case by letters ; and from the account which I have just given you, there seem'd to be some fault in the right abductor muscle, whose strength was not altogether correspondent with that of the left adductor muscle : the same fault also seem'd to be in the neighbouring depressor of the right side, and even upon a more strong conjecture, to wit, that it could not depress the eye equally with the left depressor muscle, whereas, in other respects, the remaining muscles of the eyes, being endow'd with their natural strength, turn'd both of them equally to the left side, and mov'd them equally upwards ; and thus the images of the different letters were painted on those parts of the retina, in both eyes, where they are us'd to be painted ; but if the eyes were cast downwards, or turn'd to the right side, as they were, in both these cases, by the fault of the depressor and abductor muscles, mov'd unequally, the letters then appear'd to be doubl'd, and plac'd one upon another. I therefore conjectur'd that there was a slight palsy in the two muscles ; slight, I say, as we need not suppose it very considerable, in order to account for this little inequality in the motions of the eye ; for I could not conjecture, that either retina was affected with a paralytic disorder, since it was very plain, that all the parts of the eye-ball itself were sound, and natural, as he saw well with any one eye, which way soever it was directed. And as I was under a necessity of blaming, either convulsion, or paralysis, for the sudden attack of this disorder ; I rather believ'd it to be palsy, by reason that it had no sense of uneasiness join'd with it, and gave no obstruction to any motion of the eye whatever : which marks and others of the like kind, I have been accusom'd to use, in order, to distinguish disorders from one another, in this and in other parts, as also those marks which had no place, in the consideration of so recent a disorder as this, I mean the length and difficulty of the cure, which are generally greater in a palsy than in a convulsion.

It also happens sometimes, as I have found, that a muscle of the eye coalesces in such a manner, with the nearest immoveable part, that itself, of necessity, becomes immoveable. But these many and various external causes, of which I speak, are all adventitious. What ? if from the very womb any muscle of either eye be too long, or too short ; too strong, or too weak ; too detach'd, or too confin'd, in its motions ! Will not the children, who have

such

such muscles, be born, more or less, with a strabismus, in proportion to the greater or less degree of the unnatural constitution in the muscle? And you know, I had written these things to you before the memoir of the celebrated Buffon came out (o), supported by those experiments relating to the cause of the strabismus, and its frequent and speedy cure, that are repugnant to the more common doctrine according to which I had written. If you can meet with a great number of those persons who are troubl'd with a strabismus, so as to repeat the experiments, which is not in my power; I would have you follow that method which answers best upon trial. Yet I would have you observe, that his enquiry was rather of the innate strabismus, and that which has its origin from internal causes, than of the adventitious, the external causes whereof are principally enquir'd into here by me, to which, as far as I remember, even his doctrine, and experiments, are not repugnant.

21. Before I say any thing concerning the disorders of the lachrymal passages, it is proper that I subjoin some hints, at least, concerning the inflammation of the horny coat, and other disorders thereof, since I here see no observations in the Sepulchretum of internal inflammations of the eye, nor have I any to produce myself; except that I remember, in a blind dog, the retina itself seem'd bloody, and almost black; so that it was very easy to conceive what might happen to the choroides, which, by reason of its incredible number of vessels, has sometimes appear'd to me (p), ev'n in sound eyes, to be of a bloody colour, and to that part of it call'd uvea: concerning the signs, danger, and cure of which inflammation, Boerhaave, according to his custom, has taught many things in a few words (q). But let us consider a little the inflammation of the cornea: the causes of which, although frequently obvious to the eyes of those who look upon the diseas'd eye, are, nevertheless, sometimes taken for the effects. And two examples of this I shall give you, that I have myself seen; the one in a nobleman, and the other in a miller. This miller being brought to me, that I might determine what the disorder was, which had begun to come on in the cornea, from a violent ophthalmia; I observ'd, in the middle thereof, a very small spot, in the form of a circle, whitish on its outer circumference, and almost black in the center. When I enquir'd what had given occasion to the inflammation, he said himself, that it had begun from the very time, that, while he was chipping a mill-stone, with the iron instrument commonly us'd for that purpose, something had flown into his eye, which however he had immediately wash'd out. As I suspected, and it in fact prov'd, that some little particle of the stone, or rather of the iron, had been fix'd in the cornea, and still remain'd where the speck was, and that thence the inflammation, which was very bad, arose; I brought a magnet, of moderate powers of attraction, once or twice, pretty near to the eye, and I immediately perceiv'd, that the blackish centre of the spot, which I spoke of before, was now somewhat prominent from its surface; and for this reason, because in shutting the eye, the upper eye-lid began to be sensible of something rough, which irritated its internal surface, in that part. But whether the figure of this little particle of

(o) Mem. de l'Acad. R. des Sc. a. 1745.

(p) Vid. Epist. Anat. 17. n. 2.

(q) Prælect. in Instit. § 841.

iron was such, that its lower part was broader than its upper, or whether the fibres of the cornea, being more impregnated and turgid with humours, more closely embrac'd and retain'd this particle that was fix'd there, though at first it might have been easy enough to extract it, before the inflammation had thus thicken'd the part; I say, whichsoever was the case, I could not, or, at least, did not think proper to extract it that day; and, indeed, thought it was high time to give over the attempt immediately, since the man said, that as often as the magnet was brought near to his eye, so often did he feel his eye drawn hastily, as it were, towards the magnet, and not without an increase of pain. Wherefore, prescribing to him, what had been hitherto neglected, gentle purging, and a loss of blood, and also such things to be applied to the eye, as relax the fibres, and assuage the pain, it was not long before the iron scoria, together with tears, fell out from the eye, upon which all the symptoms vanish'd immediately, and with ease. But my intention was, if it had not fall'n out of itself, to try the magnet again, after having first made the eye firm, by some proper instrument, that it might not be attracted, together with the scoria, in so troublesome a manner.

22. You see, that from the phenomenon of magnetic attraction, as it is commonly call'd, to appearance indeed useless, among those physicians, who, if they observe you to attend a little closely to the operations of nature, immediately ask you, with a malignant kind of curiosity, what you draw from thence to improve the practice of physic? You see, I say, that from this phenomenon, some advantage may now and then be deriv'd, and that not in order to ascertain the cause of the disease only, but to remove it. For there is no doubt, but scoriæ of this kind may be easily taken out by the help of a magnet, either in the beginning, when the fibres are not yet constricted, or afterwards when they are relax'd: or, at least, there is no doubt, but they may be so mov'd, and drawn forwards, as to be easily laid hold of by the forceps, if they do not fall out of themselves. Nor do I say this in regard to the eye merely, but in regard to any other part whatsoever, where such substances may be infix'd, especially as they sometimes scarcely appear, or are attended with so much pain, that you could not lay hold of them, if you would, or by reason of the pain, your patients, and especially children, will not suffer you to do it. But as I knew, that our ancestors in physic had often mix'd with their plasters, which they applied to extract heterogeneous substances, load-stone ground into powder, which being thus comminuted, and intercepted by other particles, was not able to exert its force; I began to enquire, whether, since that time, any one before me ever thought of trying the same method that I had tried; which being so obvious, made it almost incredible, that no body had thought of it. As I began with the most modern writers, after finding a deep silence, among a great number, on this head, I at length lit on a passage in Kerckringius (*r*), which relates a case of a needle, that had stuck in the throat for nine years, being extracted by a bit of a load-stone. Although he mentions none among the former authors, who had made the like experiments, yet I went on to enquire, till being admonish'd by the index of Hildanus, I read an observation of his (*s*); in which

(*r*) Spicileg. Anat. Obs. 44.

(*s*) Cent. 4. Obs. Chir. 17.

he tells you by what remedies the scoria of iron, that had been fix'd in the adnata, were remov'd. And the case, indeed, I found, which I would have you read over, being in most circumstances as similar to mine, as one egg is similar to another; but not a word of the load-stone. At length, what that "most copious" index had not discover'd, chance itself threw in my way: for as I was looking after quite another thing, I stumbl'd upon his other observation (t), *De scoria chalybis corneæ infixæ, ejusdemque ingeniosissima curatione*. And this case was happily and perfectly cur'd by the magnetical power, when all other remedies had been of no effect. Moreover, as Kerckringius was not ashamed to confess, that what had never come into the mind of any surgeon, among so great a number, he had learn'd from a certain travelling mountebank, nor Hildanus to confess, that he had the hint from his wife; for it is the fact, and not the author, that we are to consider; so the latter of the two added this remark to his observation, that we must take great care, lest, perhaps, that surface of the magnet should be by chance turn'd to the eye, which repels iron. But although I know very well, that this power of repulsion is acknowledg'd by others, in one surface of a load-stone against another load-stone, but not against iron; and although, notwithstanding Hildanus testifies, that this property was exerted by his load-stone, and Matthiolus (u), that the same effect was observable in his, I believe that they must have lit upon iron, which was impregnated with the magnetic virtues; yet I have no objection to your making the previous trial; for nothing forbids, and the experiment is very easy. But this one thing I would advise, that you chuse a load-stone of moderate properties and powers, and that you bring it by degrees more and more near to the eye, as you find it is proper; lest the iron sticking, perhaps, very closely, and the parts not being sufficiently relax'd, you increase the pains of the part in which it is fix'd, by an untimely extraction.

23. A much slighter cause brought on a longer and more dangerous ophthalmia, in a relation of mine, Thomas Mangelli; to whose case, the other example that I promis'd you, relates. For there was not one of the physicians, or surgeons, by whom the patient, though very averse to medicines, was at length compell'd to suffer his eye to be inspected, but judg'd, without the least hesitation, that an ulcer was already begun in the cornea, by the force of the inflammation, and for the sake of curing it, us'd different methods of application, both internally, and externally, and fatigued the patient greatly for a long time, who submitted to every thing with fear, but without effect. At length it happen'd, by mere accident, that one of the surgeons observ'd some kind of substance or other, begin to push itself out from the bottom of the ulcer, like a small plate, or scale; and as it easily follow'd the probe, with which he was endeavouring to lay hold of it, he took it out whole. Upon examining it pretty closely, after he had taken it out, he perceiv'd that it was the wing of a small fly; and that it really was so, every one who saw it then, and afterwards, without the least doubt, as in the most evident thing, confirm'd. And then Mangelli remember'd also, that a little before the inflammation had begun, a fly had by accident flown into his eye, and

(t) Cent. 5. obs. 21.

(u) Comment. in l. 5. Dioscor. c. 105.

that he, hastily putting his hand betwixt his eye-lids, as we generally do in that case, had kill'd and thrown it away. But he had not thrown away the whole; for the wing remaining behind, had so applied itself to the cornea, that, without the help of a surgeon, it could not have been loosen'd, and remov'd from the place. Wherefore, occasioning an irritation by its adhesion, it had given origin also to an inflammation, of such a kind, that the small fibres and vessels, swelling round about, represented the lips of a small ulcer; and the wing, beset round about with a thickish humour, through which it was seen, put on the appearance of the bottom of a sordid ulcer. For as soon as ever this was taken away, every appearance was immediately chang'd for the better; and the eye grew well easily, and soon, without the least cicatrix being left behind. I am not ignorant, however, that our Falloppius (x) writes, "that he had twice suffer'd ulcers of the eyes, from the falling in of some very small flies, which are hard; and if they fall, or even slip gently, into the eye, they immediately ulcerate it, and bite chiefly in the night-time." But it was not their smallness, hardness, nor biting by night, that had injur'd him, but only a wing left behind, which, as I have already said, resembl'd an ulcer entirely: for I remember extremely well, that I had then seen it, being a very young man, and had believ'd that it was certainly an ulcer. But suppose that it was even an ulcer, yet, that wing being remov'd, all the symptoms immediately remitted, the cause being taken away. Of so much importance is it, then, diligently to enquire into the original causes, and beginnings, of disorders, and to be so solicitous therein, as to neglect no occasion of doing it.

24. Now, as I have set out with an intention to treat of the disorders of the cornea, in such a manner, as to have describ'd those which I had made observations upon from inspection only, and not by any dissection being added thereto; I shall omit to speak of those white kinds of opacities, which seem to be on the outer edge of the cornea, the nature of which I could not discover without the use of the knife; for, if you please, you may read of these elsewhere (y). And I wish the same had been done by Mauchartus, where (z), as he shews, "that this observation was of no small moment," in making punctures, and incisions, near those places; so he wonders, at the same time, that opacities of this kind, and their nature, should have been "overlook'd." Omitting these things, therefore, on the present occasion, I will rather remark, what has frequently happen'd, while an ophthalmia continu'd violent, that physicians and surgeons have shewn me a kind of pus, or pus-like matter, on the cornea albuginea, or beyond the cornea, as it seem'd both to them, and to me, indeed, at the first sight. But I have more than once observ'd, that this appearance of things was, in some persons, nothing else but little external ulcers of the cornea, which if you look'd upon from a situation directly opposite, exceedingly believ'd the appearances I have mention'd; but when you withdrew to the side, and look'd upon them obliquely, they immediately betray'd themselves, by the hollownefs of their figures. For the cornea is easily ulcerated in acrid inflammations of

(x) Traët. de Ulcerib. c. 58.

(z) Dissert. de Maculis Corneæ § 9.

(y) Epist. Anat. 16. n. 28.

the tunica adnata; so that I fear'd nothing so much as this, in an obstinate inflammation of the eye, with which I was seiz'd when I was a young man, at Bologna, about the beginning of the present age, attended every now and then with so acute a pain, that I was frequently prevented from sleeping by it, unless a warm poultice of sweet apples was applied to my eye-lids. Many things were recommended; I tried many things, but in vain. One thing I unadvisedly rejected, which I saw afterwards was of great use to many, and especially to a man of Bologna; who having, by means thereof, got rid of the inflammation of his right eye, presently, when the left was troubl'd with the same disorder, after having made use of others in vain, could be restor'd by no remedy but the same, that is, by ulcerating the skin behind the ear, by applying such medicines, as have the power of eroding it. Having, therefore, committed every thing to time and to nature, and being in some measure reliev'd, yet not so much as to read, and to write, even then, without uneasiness and pain, and depending more upon my memory than on my present studies, I underwent the usual examinations, and being enroll'd in the list of doctors, I retir'd for a little time to the place of my nativity, and there I entirely recover'd. All which things I have said for this reason, that you may understand, after how great a disorder of my eyes, how great a share of strength and health is granted to me, by the blessing of almighty God; so that, being at this time about seventy and eight years of age, I see, without glasses, almost with the same ease I did before that inflammation had seiz'd me. And if you should, perhaps, ask me, by what means I have prevented a disorder in them for so very long a time, notwithstanding I have applied so closely to my studies by night and by day, I should answer, by no other method, than by washing my face and eye-lids every morning, which I began to do from that very time, but not so as to use any water that first came to hand, but that only which was just drawn from the well: for this, though it is indeed cold, yet is so far cold only, that it can restore and preserve the tone of the fibres, which a preceding ophthalmia had weaken'd, without those dangers which Hildanus (*a*) fears from the most cold water. But I cannot certainly know, whether water of this kind be what the celebrated Dethardingius means to recommend in that little work which he publish'd at Copenhagen, in the year 1745. entitl'd, *De specifico proptylactico oculorum*; although the very learned Haller (*b*), from whom alone I have the knowledge of this work, says, that the specific is "washing with cold water." But this I know for certain, that when I had at length, through indolence and neglect, omitted the use of the water, which I have mention'd, the inflammation, that had been gone for more than forty years, soon return'd; at first, indeed, but slight, and affecting the eye-lids only, but of long continuance; and after that, when it seiz'd most people here in the summer, the tunica adnata was so violently affected with it, that it began already to degenerate into a chemosis: which, however, was overcome without bleeding, as I shall tell you in another part of this work (*c*). And since that time, which is now nine years, I am almost as strong, and well with my eyes, as

(*a*) Cent. 1. obs. 27.(*b*) Ad Boerh. Meth. Stud. p. 14.(*c*) Epist. 57. n. 9.

I formerly was; nor do I need any help of glasses. May God grant, that my age, still increasing more and more, may not diminish their usefulness. But let us now return to those disorders, which I have seen in the eyes of others, and leave those which I have suffer'd in my own.

25. In regard to the unguis oculi; for thus Celsus call'd (*d*) in Latin, what with the Greeks we should call *πτερυγιον*, and that nine times, and yet no where: for by reason of the doubts of some in regard to his books, as they are in manuscript copies, or printed, I search'd into them, and found the reading thus various. In regard to the unguis oculi, then, you are not ignorant, that I conjectur'd, in the *Adversaria* (*e*), the more frequent origin of the unguis oculi to be from that semilunar membrane, which, as some seem to hint, Vidus Vidius had describ'd, at the internal angle of the eye, in book the seventh, chapter the fourth, of his *Anatome corporis humani*; in that place, I suppose, where the caruncle, and the puncta lachrymalia being describ'd, he speaks also of a gland, at the internal canthus, in the human subject, and even, with the leave of God, a cartilage, and a membrane involving it. But I did not conjecture, that the origin of the unguis was from the membrane of the cartilage, in a beast, but from the membrane which I had describ'd before the human caruncle. I had some years ago an opportunity of considering this disorder very attentively, in a man of forty years of age, who in each of his eyes had an unguis that had begun from the very time when he was a young man, and had at length extended itself even to the very middle of the cornea; when coming to Padua, to the very experienc'd public professor of surgery, Jerom Vandelli, by whom he was cur'd, he came also to consult me. And I saw, that the unguis consisted of this very membrane, which, growing out from a broad basis, had enlarg'd itself into the form of a triangle, not much adhering to the adnata, and even so disjoin'd, to the middle of its length, that Vandelli pass'd a probe, of a moderate size, with great ease, between the two: but it was closely connected to the cornea, with which the extreme vertex of the triangle corresponded; so that when the patient turn'd his eye, to look at those things which were on one side of him, the whole unguis was necessarily extended: and hence it had also happen'd, that the lachrymal caruncle following the membrane which was fix'd before it, was not only made much longer, but also drawn forwards from out of its natural situation. The nearer the membrane was to its basis, so much the less did it recede from its natural appearance, being red from the vessels, with which it was spread over, so that in this part you would readily give it the name of *pannus*; the other parts of it being whitish, so that it would be better to call them *unguis*. They were, nevertheless, opaque; for which reason a great part of the rays being intercepted, the patient might seem, in some measure, to have been affected with the nyctalopia of Hippocrates (*f*); for he saw better in the evening than at noon, and in a somewhat dark, than in a light place, I believe, without doubt, because by reason of that interception of rays, the iris had accusom'd itself to dilatation. Yet there was no great pain in the eyes, nor any great impediment to their motion.

(*d*) De Medic. l. 7. c. 7. n. 4, & 5.

(*e*) VI. animad. 44.

(*f*) Vid. supra. n. 29.

26. But now I must speak of weeping from disease. Those things which you will read on this subject, in the *Sepulchretum*, would either have been omitted, or not so explain'd, if what is propos'd concerning the natural weeping in the same book (*g*), and is in part true, could have been constantly adher'd to, nor confounded with the fallacies that are mix'd therewith. At present, out of four observations, relative to the encreas'd secretion of tears, there are three (*b*), which would vainly obtrude upon us for the cause of it, the exuberant quantity of moisture, within the skull, as if there were a passage from thence, for the tears, to go to the eyes: which ought so much the less to have been done, because that exuberancy of tears, especially in the women, manifestly proceeded from grief, or from pain. Then also the orbicularis palpebrarum muscle being frequently, strongly, and for a long time, contracted, as we see happen in persons who weep, the glandula innominata, is by that means more and more urg'd to secrete a greater quantity of moisture, and pour it out betwixt the eye-lids; and at the same time, the soft and slender passages, which convey this moisture to the greater lachrymal duct, are compress'd, so that they can carry off less of the same humour towards the nose. And in the other observation, mark'd thirty-three, "the calculus which was found in the lachrymal gland," for so it is written, "plac'd at the internal angle of the eye," indeed might be the cause of this morbid secretion of tears; but not because "it render'd the whole gland unfit for the reception of the humidity that was to be transferr'd to the nose," for this is not a gland, (and I wonder that this error should still prevail among some persons) but is only a caruncle, which has its surface cover'd with very small sebaceous glands, nor does it receive the humidity into itself: yet because the calculus was not only "very unequal," but in proportion to the part, in which it was seated, very large also, as the delineated figure of it that you may see in the author's work, from which it is taken (*i*), evidently shews, it remov'd the puncta lachrymalia from being in contact with the eye, and consequently prevented them from receiving that humidity, and moreover compress'd the small and slender canals, proceeding from these puncta.

27. And indeed the most frequent and obstinate causes of lachrymation, consist in the compression, obstruction, and coalition, of the lachrymal passages, from the eye-lids to the interior parts of the nose. And it happens not very uncommonly, when I demonstrate the internal parts of the nose in my anatomical courses, that I find an appearance of this kind, as I did once, for instance, in a dropsical man, in whom, the lower orifice of the lachrymal duct being wanting, on the right side only, I found that the duct itself had grown up: and the same I observ'd in a woman, who died of a fever. But in this last case, although the lower orifice of each duct was small, nor admitted the probe very high; I soon ceas'd to wonder, because I found, when I was about to pass it from the eye-lids, into the duct, that all the four puncta lachrymalia were entirely shut up. And I remember that formerly, in another woman, whose eye-lashes had almost all fall'n off, from the

(*g*) Sect. hac 18. post obs. 33. Append. 1.
& Schol. ad obs. 11. in Additum.

(*b*) 1. modo cit. & 31. 32.

(*i*) Blasii Obs. Med. Tab. 9. Fig. 10:

left eye, as the effect of some disease or other, one of the puncta lachrymalia, and the little canal, and the whole remainder of the duct, even to the internal part of the nose, were not only shut up, but had degenerated by a coalition of the parietes into a solid ligament; yet I found the other punctum, with its little canal, not only open, but even the cavity of each twice as wide as it us'd to be, because the humour that had enter'd into it indeed, but had been oblig'd to stay there, till it was press'd out with the finger, had dilated it after that manner. But in another man, I do not remember there was any dilatation, although each duct was altogether impervious, below the sac, as it is call'd. It were to be wish'd, that we could be inform'd from what disorders these appearances in each of them had happen'd, and of how long standing they had been; whether they happen'd from an inflammation of the eyes, or of the internals of the nose, or from a suppuration and exulceration of these parts, and with what difficulties and diseas'd symptoms they had been attended: but this is almost impossible in the common people, who are very often unknown, nor ever complain of any other disease, than what troubles them at the time, when they come into hospitals; and it is in vain to make enquiries after death. But two things, at least, are certain, that every one of these must necessarily have had a morbid weeping; the second woman, and the second man, from one eye, but the first woman, and the last man, from both eyes: nor could the lachrymal passages in any one of these have been freed from their obstructions, and laid open.

28. But in those morbid flowings of tears, the causes of which may be either obstructions of the passages, or if a coalition, that only, which may have happen'd in the upper or lower orifices, and compressions also, but such as have not yet brought on, a very great coalition, and may be remov'd by art, for instance, if a polypus, or if a fungus, growing out from a neighbouring ulcer, should have compress'd the lower part of the duct, as in the observation of the celebrated Molinelli (*k*); there is not the least doubt, after so many successful experiments, of ingenious men, but surgery may be of use. The most mild method of all is that of Mr. Anell, and is sufficient in slight obstructions; but of this I have spoken on a former occasion (*). Yet that part of his method, which consists in passing a small probe, through one of the puncta lachrymalia, into the nose, Valsalva affirm'd in cases of consultation, which I have read in his papers, that he had administer'd before Anell, and had by this means open'd the nasal duct.

29. But in regard to encysted tumours, into which the glands of the eye-brows may be dilated, and in regard to the method of curing them, both he (*l*) and I have written (*m*) on other occasions. It remains, therefore, to subjoin one or two observations on the disorders of the eye-lashes. And that seems to be a very slight disorder, which consists in the whiteness of their colour. Yet it must necessarily be hurtful to vision, in a bright light. For it cannot sufficiently keep off the superfluous rays. Wherefore an example is extant, in Caspar Hoffman (*n*), of a certain person who having his eye-

(*k*) Comment. Bonon. Sc. Acad. T. 2. P. 1. in Medicis.

(*) Adv. VI. Animad. 62. & seqq.

(*l*) Tract. de Aure hum. c. 4. n. 4.

(*m*) Epist. Anat. 13. n. 2.

(*n*) Comm. in Gal. de Us. Part. 1. 10. c. 7.

lashes white, saw better as often as they were painted black. I have lit frequently upon men, who had the hairs of their eye-lashes white, from their birth, and they all became blind. Could this happen from the colour of the eye-lashes only? It would have been an easy experiment, if time and place had suffer'd us, to make them black. But what is it I have heard of these persons, that if they cut the hair of their heads, they are then still more blind? There are much more grievous, and much more dangerous disorders, attending the eyes, from those diseases of the eye-lashes, that are call'd trichiasis, and distichiasis. For the eye-lashes being either turn'd in upon the eyes themselves, or another row of hairs "growing under them," and, as Celsus says (*e*), pointing quite inwards upon the eyes," the eyes are so much irritated, that an inflammation succeeds to the irritation, which is incurable, unless these diseases are remedied; and a blindness may easily be the consequence of the inflammation. And these disorders cannot by any means be taken away, in such a manner as not soon to return, except by those methods of cure, which are attended with pain, or rather with torture, or even with the mutilation of the edge of the eye-lids: and I am afraid, left beside the deformity, the extremities of the ducts of the sebaceous glands, which are in the tarsus, should be perhaps shut up by the cicatrix, that is brought on, and thus give origin to many kinds of diseases. And the case being thus, it were indeed very much to be wish'd, that the remedy, at least, to prevent such an irritation, which is propos'd by the celebrated Erndel (*p*), might have a success equal to the ingenuity with which it was invented. He propos'd putting betwixt the eye-lids and the eye, a smooth and well-polish'd glass, made just in the same manner as we see the artificial eyes are, except that it should be without any painting: and thus it would happen, that the hairs indeed, but not the rays of light, must be excluded. But whether so thin a glass, as it must necessarily be, not to refract the rays, made the danger of breaking it be much dreaded, or whether it was fear'd, lest the effluvia of insensible perspiration should constantly stain, and darken the glass, or should injure the eyes, by too great heat, especially in the summer time, or, being grown acrid by delay, should irritate the surface of it, or should create a troublesome and dangerous necessity, of taking out this thin glass now and then, in order to wipe and replace it, or whether any other causes whatever, scarcely any of which fall upon the use of the artificial eye, have deterr'd us from the experiment; I have never heard, or read, of any one person, who, since the twenty-second year of the present age, in which this remedy was publish'd, has ever made use of it, even to the present day; or who, being excited by the knowledge of this, has endeavour'd to invent any thing better.

The same learned gentleman propos'd a conjecture, of the manner, in which the hairs break forth, in a distichiasis, in an improper place; which place he seems to point out much higher than it was in that distichiasis, the description of which was sent to me by the celebrated Tabarranus (*q*). For he imagines he saw the hairs coming out from the mouths of the sebaceous glands,

(*e*) De Medic. 1. 7. c. 7. n. 8.

(*p*) Eph. N. C. Cent. 10. obs. 75.

(*q*) In Epist. præfixa alteri Editioni suar. obs. Anat.

which

which I spoke of just now. I do not doubt, but the hairs that are preternatural can make a passage for themselves, to come out within the eye-lids, as they do in other parts. Yet it has hitherto never happen'd, either in living or dead bodies, which last I would prefer, that I have had an opportunity of examining these things accurately. Nor is it to be wonder'd at: for if any limb, or part of the human body, consists of so many smaller parts, that it is very difficult to get opportunities of examining all the diseases of each distinctly, in dead bodies, how much more difficult must it be in the eye? which, as it is made up of so many, so various, and so tender parts, and that not only in its own substance, but in the appendages which lie about it externally, and as it is, moreover, expos'd to the injuries of the air, and other things, and continually given to exercise, unless when we sleep, and as, for these reasons, it is liable to innumerable diseases, both internally and externally, physicians have not been wanting formerly, nor are at present wanting, who, under the name of oculists, have applied themselves only to the cure of disorders of the eye. Wherefore, I would have you be satisfied with receiving this letter from me, which relates to such disorders of this part, as it has fallen to my lot to see. The next I shall send you, will be upon the disorders of the ear. Farewel.

LETTER the FOURTEENTH.

Of the Disorders of the Ear, and the Nose. To which are added some Observations on Stammering.

1. **A**S you know very well, that both Valsalva and I have publish'd more upon the ear than the eye; you will not in the least wonder, if fewer things remain, out of the observations of both of us, to be written to you, on the one subject than on the other. Wherefore I will join to the disorders of the ear, those of the nose; especially as the author of the Sepulchretum has comprehended both the one and the other in two short sections, the nineteenth and the twentieth.

2. To the first observation of the nineteenth section, you will easily perceive, that an argument is prefix'd, which is foreign to the truth: *Aures purulentæ ab abscessu cerebri*. For, on the contrary, the abscess of the brain, no symptoms of which are said to have preceded, was the consequence of the suppression of ichor flowing out of the ear. Neither, certainly, is a second observation, given in the scholium that is subjoin'd, to be explain'd by any other method than this; although, after death, when the skull was open'd, the sanies, which us'd formerly to be discharg'd from the ear, was found within the cavity of the cranium. And as I have declar'd this already, in
a former

a former work (a), it will be sufficient to confirm it here, by pointing out the observations of Du Verney, in the third part of his Treatise of the Organ of Hearing: from which treatise, although many things should have been produc'd, in the additamenta to this nineteenth section, both what I have mention'd, and others, they are, nevertheless, not at all pointed out. And you will immediately understand, when you have examin'd them, how often physicians are deceiv'd, in judgments of that kind, when pus, as in this case, flowing out from the ear, has been suppress'd, and the patients "die, as it were, suddenly." But you will say, the serum, which Du Verney found within the cranium, was not of the same kind with that which issu'd out by the ear; but here, that which flow'd out from the ears and nostrils after death, in great quantity, seems to be the same kind of sanies, which had before flow'd out of the ear: as if, truly, it were not possible for the matter to have burst forth into the ears and the nostrils, except from the cavity of the cranium! notwithstanding the pituitary sinusses open into the interiors of the nose, as also the eustachian tube; for in these sinusses, and cavities of the ears, conceal'd from the physicians, the sanies might have been secreted and preserv'd. But see what different opinions you and I entertain. Certainly, though I had not only seen the same kind of sanies in the cavity of the cranium, that us'd to be discharg'd from the ear, as I have said, but had even seen the passage made by a caries, through which it had free access to the ear; yet I should not immediately have pronounc'd, that it came from the brain to the ear, but rather have suppos'd, on the contrary, that it went from the ear to the brain. And why so? I will tell you, when you shall have read the two observations which I shall immediately subjoin.

3. A boy was troubl'd, after the small-pox, with a complaint of his right ear, which had its rise from the relics of that disease. At length, a tumour began to appear behind the same ear, when he was about twelve years of age. He was quite deaf on that side, and the ear discharg'd a purulent matter. The integuments of the tumour being incis'd by the surgeon longitudinally, according to the direction of the head, a large quantity of pus issu'd out, such as had us'd to be discharg'd from the ear. Some hours after this incision, the boy was seiz'd with convulsions; so that he had a subsultus in his whole body, and was forc'd to emit a strange kind of voice, of a middle kind between crying out and groaning. These convulsions, at first recurring more frequently, and then more rarely, lasted to the very time of his death. But on the same day that the convulsions first began, a pain also came on, in the place where, as I have already said, the teguments had been incis'd; and a certain part of that section was of so exquisite a sense, that it would not bear even the slightest touch. On the following days, though the pus still continu'd to flow, the patient began, nevertheless, to be delirious, and to be entirely destitute of strength and pulse. After this, however, the delirium went off, and the child seem'd to recover his strength and pulse, in some measure, speaking, and looking chearfully with his eyes. But although he spoke, even on those last days of his life, and always drew his breath with ease, yet becoming worse again, he died about the beginning of February,

(a) Epist. Anat. 7. n. 8.

in the year 1740. It seem'd to me, when this history was related to me, by those who attended the child in this last disease, that the grievous complaints with which he had been afflicted, and which had brought him to his end, did not proceed from the incision of the tumour, but from the caries of the os temporis, which had excited the tumour, and at the same time reach'd into the cavity of the cranium, and thus finally had open'd a passage for the purulent matter into that cavity also. As I had made this answer in the theatre, where the head of the boy was brought, I determin'd immediately to see whether my conjecture had deceiv'd me, or not.

The face was even then fair, and of a rosy colour, (for it was the fourth day after death) nor at all scarr'd; so that it was natural to conclude from thence, that the force of the small-pox had thrown itself out upon the skin but little. The skull being open'd, and the lateral sinusses of the dura mater being found full of blood, and the vessels which run here and there through the pia mater, being full of the same; the right and left ventricles were first open'd, and a little water was seen in the former of the two, but in the latter a great deal, I believe, because by reason of the pain, he chose rather to lye upon the left side, than on the right. And, indeed, as we by degrees lifted up the corpus callosum, the septum lucidum seem'd to be broken in a certain place; but this might happen in the dissection, as those parts of the brain were extremely lax. However, this custom of lying on one side had, at least, caus'd a more ready effusion of pus inwards; which, as we presently rais'd up the cerebrum, we saw in the cavity of the fella equina, and a little after that, when we remov'd the cerebellum, upon the right side of this also, and extended in such a manner, that some of the pus seem'd to have descended to the beginning of the spinal marrow. The entrance of the pus into the cavity of the cranium, as I evidently demonstrated to all who were present, was on that surface of the petrous process of the right temporal bone, which some call "posterior," and others "internal and inferior." You will more readily conceive of it, I suppose, if I say it was that surface, by which the right and left petrous processes are turn'd towards one another. For on that surface, and at the very angle of it, if I remember rightly, which, out of all the parts that are adjacent to the fella equina, lies between the lateral and superior sinus, the caries had made a foramen, almost of a circular form, and of the bigness of a lentil. And by this foramen, pus being effus'd, betwixt that surface and the dura mater, had eroded both this, and the other thinner covering of the brain, where they invest the right side of the cerebellum; and, moreover, had vitiated the cerebellum to such a degree, that part of its surface was green, and purulent; and the nearest portion of the cerebellum, internally, which answer'd to that part, was ting'd of a brown colour, to the depth of a thumb's breadth. All the pus which we saw in the cavity of the cranium, was green, but not of a bad smell: nor was the cavity of the tumour, that had been incis'd behind the ear, attended with any bad smell; but the sides of it were very clean; and it communicated with the bony meatus auditorius. The extent of the caries, both internally and externally, being examin'd, I had not time sufficient to trace the sinusses that lay betwixt both, as I was so much taken up in my public lectures of anatomy.

But as to what relates to the cause of that exquisite sense, which was always perceiv'd in a certain part of the lips of the tumour, when open'd; I observ'd a very slender nerve, which proceeding from the cervicals, as I suppose, ascended upon that part, which had been cut, under the common integuments, and ran according to the longitudinal direction of the head: so that it was very natural to conjecture, that some part of it being prick'd or cut, at the time of opening the tumour, this puncture, or incision, had given rise to the pain the boy had so exquisitely felt.

4. You see, how liable surgeons are to false suspicions, among the common-people: whose knife, indeed, cannot possibly avoid all the subcutaneous nerves, but cannot be the cause of death by incising the integuments only, as in opening this tumour; which I could wish had been sooner open'd, or rather had sooner appear'd, to wit, before the caries had reach'd the cavity of the cranium. And my conjecture on this case was the more easily drawn from the consideration of the whole history; because Nicolaus Mediavia had communicated to me, scarcely four months before this time, an observation of his, in great measure similar to this; that is, of a caries proceeding from a fistula above the mastoid apophysis, not only into the cavity of the tympanum, but of the cranium also. But as the very experienc'd Du Verney has confess'd, that the propagation of a caries, from a fistula of that kind, even into the cavity of the tympanum (*b*), is "very rare," and that he had "only" one or two observations of that kind;" I suppose, it will not be less grateful to you, than it was to me, to hear what Mediavia related to me, the very same day on which he saw the case.

5. A young man had, as it seem'd, an old fistula, above the right mastoid process. Injections that were thrown into this fistula, return'd partly by the neighb'ring ear, with which he nevertheless heard. This young man being receiv'd into the hospital, not on account of the fistula, but for a fever, with which he had been attack'd, and growing much worse in a few days, became delirious, with an inclination to sleep, and died.

His skull being open'd, all the vessels of the brain were found to be turgid with blood. There was much greenish water in the lateral ventricles; and in this kind of water, that was in the right ventricle, pus of the same colour subsided. But a much greater quantity of this pus was effus'd betwixt the dura mater, and that surface of the petrous process of the temporal bone, which was particularly pointed out in the former observation (*c*); and thus it had made a way for itself, between both, from thence even into the tube of the vertebræ. The cavity of the tympanum, also, was fill'd with the same kind of pus. But the caries, proceeding behind the aqueduct of Falloppius, and the semicircular canals, had eroded that surface of the petrous process, after the manner of a pretty wide cleft, on the posterior side of the foramen, which receives both portions of the auditory nerves. And this cleft was cover'd by the dura mater, which in that place seem'd, in fact, to be eroded also; yet not to so great a length, as the cleft or groove of the bone. But notwithstanding the brain had a proper firmness, and was dissected the day after death, there was so strong and putrid a smell in the head, that it was

(*b*) Parte ead. Tract. cit. supra, n. 2.

(*c*) N. 3.

not in my power to trace the passage of the pus from this cleft of the bone, to the right ventricle: nor yet to enquire, whether any other parts, beside the membrana tympani, were hurt in the ear, and what parts they were.

6. This very great difference, in the degree of offensiveness in the smell, that there was between the two subjects, you must refer to the time of the year, the age of the patients, and the constitution of the humours, which is so different in different persons; but the other differences must be refer'd to other causes, as that of sleepiness, to the greater quantity of water found in both the ventricles of the brain, mix'd with pus also on the right side; as on the other hand, the deafness of the boy in the former history, must be accounted for, from the organs of hearing being much more injur'd, and destroy'd, by the caries; and the convulsions also of the same, from the nerve being wounded; and finally the loss of his pulse and strength, from the cerebellum being much affected with disease. But the symptoms, common to both, must be refer'd to the injuries common to both, as the unexpected accession of disorders so violent, to the sudden irritation of the meninges, from the pus that was effus'd upon them; and the delirium also, to this very same cause, which delay'd and obstructed the blood in the vessels, that for this reason became turgid; and in short death itself, to the erosion of the meninges, the cerebrum, and cerebellum.

But that in particular was most common to both, on the account of which I describ'd these two histories to you, I would say, that by means of a caries, a passage was laid open between the ears, which discharg'd a purulent matter, and the cavity of the cranium; nor could any one suspect, that this passage was made from the cavity of the cranium, to the ear, notwithstanding he saw a pus of the same nature within the cranium: but on the other hand, every one who attended to the order of the preceding symptoms would confess, that its passage had been from the ear to the cavity of the cranium. And as it is manifest that the ear can generate pus, and bear it without any detriment to life, much longer than the brain; it is also manifest, what judgment we ought rather to form in cases of that kind, which I spoke of to you in the beginning (*d*). Ulcers of the ears, therefore, are not to be hastily clos'd up, nor so much on account of that circumstance, which is more rare, I mean lest the exit of sanies, from the cavity of the cranium to the ears, be obstructed, as on account of that which is far more frequent, lest the exit of sanies, from the ears themselves being obstructed, a caries be either generated or encreas'd, and so much easier and sooner penetrate into the cavity of the skull. And with the two observations that I have given you, you may join two more, one from Möglingius (*e*), and the other from Laubius (*f*). For in both of these you will read, that after a sanies flowing from the ear, there was a purulent tumour round about it, that the tympanum was consum'd, that a caries was produc'd through the os petrosum to the cavity of the cranium, and finally, that there was ichor, or pus, within this cavity, attended with fatal disorders of the brain. And though you may believe, that in the second case, something, from the very beginning, was "shut up" within the brain, which obscur'd the sight; yet

(*d*) n. 2. (*e*) Eph. N. C. Cent. 6. obs. 21. (*f*) Earund. Cent. 7. obs. 40.

you will understand, that it was not encreas'd, and brought to suppuration, before the flux of purulent matter from the ear, which had diminish'd the obscurity of the sight, being stopp'd, an amaurosis first, and then apoplectic symptoms, none of which had appear'd before, came on; which would certainly not have come on, if the very great quantity of pus that had flow'd three or four times from the external tumour, communicating with the meatus auditorius, and which certainly could not have been at that time within the cerebrum, had been equal to the task of exhausting all that putrid matter, which was generated in and about the ear, and averting it from the brain.

7. That worms are generated in long ulcers of the ears is not only a common observation among medical writers, but is also a very ancient opinion, as Dodonæus (*g*) shews, from Dioscorides, Galen, and Aetius; to which you may also add the more ancient authors, from whom Pliny took remedies (*h*), that were to be dropp'd into "ears that generated worms," to kill "worms therein." It will not, however, I suppose, be disagreeable, if I subjoin an account of much greater disorders being excited by worms in a young matron, than have been observ'd by Lanzonus (*i*) and Behrius (*k*). I was by chance with Valsalva in the place of his nativity, when she came to him, and related, that having, when a virgin, had a worm come out of her left ear, she also discharg'd another from the same ear six months before the present time: that the worm was of the shape of a small silk-worm, and was discharg'd, together with pus, after a violent pain of the ear, which had extended to the forehead, and temple that border'd upon the ear, but immediately ceas'd after the worm was ejected. But from that day, at various intervals, she was seiz'd frequently with the same pain, but much more violently, so that she fell down suddenly, being depriv'd of all her senses for two hours together, till the pain going off, she came to herself again, and soon after discharg'd a worm from her ear, of the same form, but less, the deafness of that ear remaining, and a stupor of the neighbouring parts, join'd with a kind of itching. Valsalva did not doubt but the tympanum was ulcerated: and to drive out, or destroy the worms, if any remain'd, he propos'd a water distill'd from the herb hypericum, or St. John's wort, in which quicksilver had for some time been shaken. You will see other remedies recommended by others, particularly by du Verney (*l*). To me there certainly seems no safer remedy against worms of this kind being first generated, or against their being regenerated, when they have once been driven away, than never to sleep in the day-time of the summer or autumn, without having the ear, in which the ulcer is, stopp'd up. For then the flies, allur'd by the sanies, and ulcerous flesh, enter into it, without the patient knowing any thing of the matter, and lay eggs therein, from whence, afterwards, worms arise, or if they happen to be viviparous insects, leave worms themselves behind them. Nor have they their origin from any thing else but flies: from which, even Homer (*m*) formerly accounted for them, and not from putre-

(*g*) Medic. Obs. Exempl. rar. in Annot. ad Valesc. Tharant.

(*h*) Nat. Hist. l. 20. c. 14. & 23.

(*i*) Eph. N. C. Cent. 5. cb. 72.

(*k*) Eorund. Aët. T. 4. obf. 29.

(*l*) Parte ead. Tract. cit. supra, n. 2.

(*m*) Iliad. 19.

faſion, when he introduces Achilles, as fearing leſt the flies “ ſhould breed “ worms in the wound of the ſlain Patroclus. And if they have ſufficient food to thrive upon, from gnawing in the ulcerated meatus auditorius; ſo they might have a proper place wherein to undergo thoſe various changes, deſcrib'd by the very ingenious Reamur (*n*), the laſt of which is, that they become flies; and for this reaſon, the caſe affirm'd by Klaunigius (*o*), of very violent pains of the ear, and diſturbances of the head, immediately ceaſing, when a fly flew out of that ear, though they had been conſtant for the ſpace of two months before, is leſs difficult to be explain'd, than what he ſeems to have believ'd, to wit, that this fly had continued all that time in the meatus auditorius.

But in order to drive away worms from the penetralia, or interiors of the ear, perhaps the ſmoke of proper things drawn in by the mouth, in ſuch a manner as to be forc'd into the cavity of the tympanum, by the euſtachian tube, might be of great effect, as I have mention'd in a former work (*p*); although, indeed, I there ſaid nothing of removing worms from that cavity, through the membrana tympani already eroded by them, inasmuch as what I there attempted to treat of, requir'd the membrane to be ſo far unhurt, that it could reſiſt by its elasticity, and repel even the medicated air, which was forc'd thither by the way of the euſtachian tube, the lips and noſtrils being at the ſame time compr'eſs'd; I ſay, repel it ſoon after by the ſame paſſage, in order to purge away the noxious matter, gather'd together in the tympanum. And when you read this over again, I would have you conſider, what there can be that is new, in the ſame method of cure, as it actually ſeems to me, which was propos'd in a very ſhort medical and chirurgical writing, that was publiſh'd eight years after. But let us come to other things.

8. The obſervation which is here the ſecond in the Sepulchretum, and to be read in the ſecond ſection, under number fifty-three, is the ſame that is commended by du Verney (*q*). And indeed it ſhews, that from a ſteatoma, growing between the cerebrum and cerebellum, the optic nerves being thereby firſt compr'eſs'd at their origin, then the acouſtic which lie under them, and at length others, an amauroſis muſt firſt of all be the conſequence, then deafneſs, and in the laſt place death. But du Verney teaches us, which ought to have been added to this obſervation, by way of ſcholium, in the new edition of the Sepulchretum, by what marks, although the internal parts of the ear do not come under the notice of the ſenſes, in the ſame manner as the eye, ſo that we can equally determine by inſpection, how far either of theſe organs is hurt; yet he teaches, as I ſaid, by what marks we may conjecture, even in the ear, that the diſorder entirely conſiſts in the nerve. From which it is certainly very probable, that thoſe diſorders were in a woman and a man, that are mention'd by me, on another occaſion (*r*); I mean deafneſs, and heavineſs of hearing, before the apoplexy of each.

9. To the third obſervation, many things are added in the ſcholia, concerning the cauſes of a tinnitus, and other ſounds of that kind, in the place

(*n*) Memoir. pour l' Hiſt. des Inſect. T. 4.
Mem. 7. & 8.

(*o*) Éph. N. C. Cent. 8. obſ. 17.

(*p*) Epiſt. Anat. 7. n. 14.

(*q*) Traſt. & Parte cit. ſupra n. 2.

(*r*) Epiſt. 4. n. 8. & 11.

of which, other remarks taken from du Verney (*s*), in like manner, would have been far better substitutes. Yet in these scholia, some things are contain'd, that are not contemptible by any means, as that, for instance, concerning a heaviness of hearing in some fevers, not being always a bad sign, and even sometimes a good one, especially if it be join'd with those symptoms, which indicate that peccant matter is thrown out, from the internal ears, by the eustachian tube. And indeed, Valsalva, as I have already told you (*t*), in deafness which came on in acute diseases, often found a large quantity of water in the tympanum. But how far it is allowable, or not, to bring this water, or other humours, through new foramina, from the cavity of the cranium, into the tympanum, as he did, I seem to myself to have made a pretty large disquisition already, on a former occasion (*u*), so that I need not add any thing else here, especially as they who have written since me, on the subject of these foramina, do not seem to have read that disquisition of mine. For the sanguiferous vessels I also saw pass through them, but at the same time I put you in mind, "that they were not found in all," in such a manner, "as entirely to obstruct the foramina:" and in fact, how can very small arteries fill them up, even when they do occur, where the foramina are "very far, indeed, from being small?" for both Valsalva and I have certainly found them, more than once, pretty large. But I will not as I said, do over again, what I have already done. I will rather return to the tinnitus. On which subject, in a dissertation of a certain celebrated man, I read what follows: "It is a very rare observation which Hieron. Mercurialis, in his Consultationes Medicæ, tome the second, observation the hundredth, mentions of a man, and Felix Platerus, in his Observationes, book the second, page 372, of a woman, in whom the tinnitus was so vehement, as even to be heard by the persons who were about the patients." But the first of these authors says, that this was "by no means certain." And in the book of the other author, whom he quotes, I can find nothing at all like it; only in page 371, I read that the fœtor of the purulent ear, "was troublesome to the bye-standers." But if you should chance to find, what it has not been in my power to meet with; see if you are not rather to understand it of the sound of the artery, pulsating within the ear, as du Verney remarks, in a certain matron (*x*): or if it was really a hissing, believe that it was from air, which, being collected in the cavity of the tympanum, and soon after shut up, broke forth from thence on a sudden with great violence, through a foramen, which it might have open'd for itself, in the membrana tympani, or at its upper border (*y*).

10. The fourth observation proposes a cause of deafness from the birth, in the incus being deficient, or in all the ossicula auditus, being a third part less than is natural. But in another scholium, and the appendix subjoin'd thereto, I see that these causes are call'd in doubt, because the membrane of the tympanum, and the ossicula being broken, a capacity of hearing still remain'd. And this is also confirm'd, by the observation of Valsalva (*z*), in a

(*s*) Parte modo indicata.

(*t*) Epist. 6. n. 5.

(*u*) Epist. Anat. 7. n. 5. 6. 7. 8.

(*x*) Tract. Parte sæpe indicata.

(*y*) Vid. Epist. Anat. 5. n. 16. & seqq.

(*z*) Tract. de Aure hum. c. 5. n. 5.

woman, who had the membrana tympani eroded on both sides, either altogether, or in great part, and on one side had none of the little bones, but the basis of the stapes, remaining, and on the other side the incus entirely disjoint'd from the stapes, yet had never been deaf, but only heavy of hearing for a long time. And of the same nature, certainly, are the observations of Vieussens (*a*), who found the same appearance in the same membrane, in the bodies of many persons, who nevertheless had not been deaf, but had only heard with difficulty and imperfectly; and, moreover, he found the muscles of the ossicula corrupted, and almost destroy'd, and the bones themselves quite thrown out of their order and connexion: and we must esteem it just the same thing, as if they were wanting, that they are so plac'd, as not to be able to perform their functions. However, I would have you just attend to these circumstances, both in relation to the ossicula, and the membrana tympani. If, in the rupture of this membrane, the stapes fall out, not only the tympanum itself, but the very soft little membranes of the labyrinth, lie open to injuries, through the fenestra ovalis, which is by this means uncover'd: wherefore, I have never read, as far as I remember, of any one who preserv'd his hearing long after the stapes had entirely fallen out from his ear. And though Valsalva, also, has expressly affirm'd, that the membrana tympani is not altogether necessary to the sense of hearing (*b*); yet I would not have you forget, that it is necessary to protect those parts, which are so immediately necessary to hearing, that, if they are injur'd, we cannot hear; I mean, the labyrinth, whose fenestræ it preserves from external injuries: so that, if a greater, or more frequent, violence of this external force urges the soft and tender membranes, in particular, which are very weak, even from their origin, it can scarcely happen, but that, in a pretty long course of time, these injuries must prevail, and hearing be destroy'd. But if this happen'd, neither to the woman whom I before pointed out to you, nor yet to dogs on which Valsalva has made the experiment, that Holder (*c*) and Willis (*d*) had mention'd; without doubt, it was because, before this destruction of hearing could come on, nature had so repair'd the membrane of the tympanum in the woman, which had been in part eroded, and the same membrane in dogs, which had been broken through, as Valsalva found in his experiments (*e*).

Nor would I have you object to me, that they who have a foramen in this membrane are, nevertheless, not subject to these external injuries in their organs of hearing, though they can force out the smoke of tobacco, that they draw into their mouths, through this aperture: for I would wish you first to read over the examen, which I have made (*f*) into the testimonies of most of the authors who have mention'd their having seen it. And you will find, in the first place, how few there are who, you can be certain, have seen it: in the next place, that there is, perhaps, not one amongst them all, who tells us, for how many years this had continu'd, without losing the faculty of hearing: finally, you will observe, that there might be such a structure of

(*a*) Tr. de l'Oreille. p. 2. ch. 4.

(*b*) N. 5. cit.

(*c*) Añ. Philos. Soc. R. in Anglia, a. 1668.

n. 1.

(*d*) De Anima Brutor. c. 14.

(*e*) N. 5. cit.

(*f*) Epist. Anat. 5. n. 14.

this foramen, that the air could go out, and not enter; and that the passage might be so straiten'd, as but very little air, and no dust, nor any thing else of that kind, could pass through, as even the smoke itself did not come forth without being driven with some force.

You will, therefore, consider these things, when you shall light on any cases, either of broken ossicula, or of erosion, or perforation, in the membrane of the tympanum. Now let us return to the rest of the observations produc'd in the Sepulchretum.

11. In the fifth, is propos'd an injury of the hearing, from a cause unknown to the ancients; I mean, from the fordes of the ears growing stony. Galen, indeed, had written (*g*), "that in the number of those things, which obstruct the meatus auditorius, were the fordes also, which are generally collected in the ears." Nor did he hesitate to mention the remedy of Apollonius, "against the fordes of the ears (*h*);" nor his own, "to draw out the fordes from the ears (*i*);" which he seems to have taken from Apollonius, from whom I shall also suppose that Celsus had before receiv'd his (*k*): and these you may now compare with those which Boerhaave (*l*), and Dethardingius (*m*), say, that they and others had us'd with success. But although Celsus (*n*) propos'd "to soften the hard and concreted fordes, and to take them out with an ear-probe," as they sometimes became much harden'd; yet he, and the rest of the ancients, do not seem to have taken any particular notice of calculi generated in the cerumen aurium, no more than they have of the calculi in the vesicula felleis, as our Casseri has done in this observation. Nor, indeed, are the instances frequent, since from the times of Casseri, who said they were "very rare," I see that only one observation of this kind, which is that of Carolus Josephus Mullerus (*o*), which is commended, and which he also thought "extremely rare." And at Padua, at least, which I may take upon me to affirm, it is hitherto very rare to find the cerumen so concreted, that you may draw it out entire from the meatus, which is fill'd with it, as you would draw a sword from its scabbard, or a tent from a fistulous ulcer; unless the ears happen to be deaf from a deeper-seated cause, and for that reason neglected; as in a man of whom I spoke in a former work (*p*), and as I saw again in an old woman, in whom the little membrane, which connects the basis of the stapes with the fenestra ovalis, was become bony. But that there are other countries, in which the cerumen aurium becoming even still more indurated, is so frequent a disease, as to make the circulatory surgeons undertake the cure of deafness which arises therefrom, I readily believe: for even in France, that the cerumen is often "inspissated like gypsum, and is very often found exactly filling up the meatus," I knew from Du Verney (*q*), and from Vallálva (*r*), whom I commended before, yet that this cure was nevertheless there administer'd by "the most skilful surgeons;" but in Holland, I heard, which was afterwards confirm'd by

(*g*) De Sympt. Cauf. l. 1. c. 3.

(*h*) De Compos. Medic. sec. loc. l. 3. c. 1.

(*i*) De Remed. parat. facil. c. 10.

(*k*) De Medic. l. 6. c. 7. n. 7.

(*l*) Prælect. in Instit. § 551, 608, 850.

(*m*) Eph. N. C. Cent. 5. obs. 81.

(*n*) N. 7. cit.

(*o*) Eph. N. C. Dec. 2. a. 6. obs. 162.

(*p*) Épiôt. Anat. 5. n. 26.

(*q*) Parte sæpius cit.

(*r*) Tract. de Aure hum. c. 1. n. 12.

reading the dissertation of the celebrated Du Bois(*s*), that this kind of deafness "is seldom cur'd, because it is well-known to few:" so that I did not think it foreign to the purpose of this method of cure (*t*), which Valsalva had said (*u*) was us'd also by him, and perhaps the first among our countrymen, to relate the event, and to add the example of another deafness, which lasted ten months, after an acute disease, whether from cerumen, or from any other matter, cur'd by the same hand, and, on that occasion, to touch slightly upon the methods of cure that he was wont to make use of in such cases; although, as I there expressly affirm'd, they were "common "with others."

Whether Du Verney has quite the same methods, you yourself will see. I, at least, seem to myself to have neglected that which Du Verney related, "from the forty-fifth observation of the first volume of the works "of the celebrated Bartholin;" to wit, that his wife "had discharg'd small "stones through the meatus of the ear, together with the wax;" who, without doubt, I would acknowledge, "had extracted little granules of sand "with the wax," but not little stones. As to what remains, and relates to the observation propos'd in the Sepulchretum, if the cerumen has, at any time, approach'd to the nature of a calculus, it certainly had in the case that Valsalva tells us he cur'd: which circumstance, join'd to the more retin'd situation of the meatus, wherein the cerumen had been indurated for twelve years together, gave to every one the highest opinion of his diligence, and skill, in taking it out at different times, and in different portions, as he was under a necessity of doing. Nor yet was the patient "oblig'd to learn "words, and speaking over again;" although "he had recover'd his hearing, "after having lost it many years together;" for he had continu'd to talk during his deafness, as deaf persons generally do: so that I do not understand, how that could possibly be asserted, by a most excellent man, which certainly never happen'd to any deaf patient of ours; except he there spoke of some very forgetful person, or one who had not sufficiently learn'd to talk before he became deaf. But that brute-animals, inasmuch as they are without hands to cleanse their ears with, "frequently rub their ears against "pieces of wood, trees, or stones, that they meet with in their way," and "that unless they do this, they grow deaf," he has, indeed, rightly affirm'd. Yet to this we may add, that the great moveableness, which is given by nature to their auriculæ, or external ears, is given for this very reason, "that by "making various motions on all sides, the acrid recrementitious matter, and "whatever could give them uneasiness, might be easily expell'd from their "ears;" as Casseri has admirably well judg'd, in that very chapter from which this fifth observation is taken (*x*). What? if I should add to the auriculæ, that first part of the meatus, or the cartilaginous tube, "in which "the foides of the ears are contain'd (*y*)." I do not doubt, but if you consider this tube, even in the figures which he has given of brutes, and at the same time attend to the situation thereof, its structure, and its muscles, you

(i) De Auditu § 15.

(r) Epist. Anat. 13. n. 3.

(s) N. 12. cit.

(t) Pentæsth. l. 4. f. 1. c. 19.

(y) Declar. fig. 2. tab. 1. l. ejusd. ad CC.

will actually perceive, that this tube being agitated in many different ways, at the same time, with the auriculæ, and being separately drawn out, and contracted, the discharge of the fordes may, at that time, be more easily promoted.

12. The sixth observation being pass'd over, inasmuch as it proposes no peculiar injury of the auditory nerve, nor any visible one of the ear itself, the added observations follow. And the first of these, as far as it determines the cause of an incurable deafness to be the *membrana tympani*, which was "very thick from its original conformation," if this thickness was really very great, is certainly to be approv'd: but it is uncertain, whether Laurentius saw it thus or not. It is certain, however, that he had written it, yet not in "book the fourth, chapter the eighteenth," of his *Historia Anatomica*, but in book the eleventh, chapter the thirteenth; and that the same was seen by Lanzonus (z), in another person, "who had been deaf from his "birth." And as to what is subjoin'd to the same observation, from Bauhin, of a great quantity of thick mucus being found in the cavity of the *tympanum*, and frequently opposite to the *membrana tympani*, especially in children, as our Fabricius had observ'd, whose testimony is also inculcated in the second observation; certainly, this cause is of such a kind, that, as long as ever it continues, there is no doubt of a deafness, or a great injury of hearing, being the consequence. But how far some have gone, and abus'd the words of Fabricius, I have already sufficiently shewn in one of my *Epistolæ Anatomicæ* (a), without, however, for that reason, denying what I have even affirm'd to you in a former letter (b), that a sanious matter may be found in the *tympanum* from the effect of disease; to which you may also refer the observation of Schulzius (c).

Moreover, in the fifth of the *Epistolæ Anatomicæ* (d), those questions are debated at large, nor altogether without accuracy, which relate to the third observation taken from the same Fabricius. For Fabricius had, in fact, found "twice," in very young children, "a very thick and strong membrane," added externally to the *membrana tympani*; and, for that reason, likely to prove the cause of future deafness. But others have not doubted, that this was the same, which, after Kerckringius, was found to be common to all infants, by Du Verney, Valsalva, Chesselden, Waltherus, Winslow, and, in like manner, by Ruyfch, Drake, and other learned men. The two last of these anatomists have suppos'd it to be an expansion of the cuticle; but the five former have describ'd it as a thick, mucilaginous, whitish, and almost fluid substance: and, indeed, I find, that all of them have attended to the truth, but in different ways from one another; for not only the thin expansion of the cuticle, both in *fœtusses*, and in adults, makes the outer lamella of the membrane of the *tympanum*, but also, in *fœtusses* peculiarly, and in children recently brought forth, a soft matter is laid thereon, which resembles an integument. But as I have shewn, that this matter is of the same sebaceous kind, with which the skin of the *fœtus* is smear'd over, you

(z) Eph. N. C. Cent. 3. obs. 62.

(a) VII. n. 15, & 16.

(b) Epist. 6. n. 4.

(c) Act. N. C. tom. 1. obs. 223.

(d) N. 1. & seqq. usq. ad n. 13.

see how natural it is to conceive, that it must be rather dried up and fall off, than degenerate, in some children, into a very thick and strong membrane, for which degeneracy the cuticle itself is certainly far less unfit.

And these things I thought it necessary for me to touch slightly upon, in this place, that you might see what my opinion was, concerning this last observation, and at the same time, that if you ever should read me number'd among those who have asserted, that the kind of membrane which is found lying over the membrana tympani, in new-born infants, is nothing else but the cuticle; you may read over again, the passages of the *Epistolæ Anatomicæ*, which I have pointed out. And this I would also have you do, where-soever you shall perceive that I am compell'd to touch upon over again, any thing that I had treated of before, as I did above at observation the fifth (*e*); not so much lest I should be wanting to Valsalva or myself, as lest I should be wanting in justice to the observation itself, or to you.

13. As to the fourth observation in the *Additamenta*, of a double membrana tympani, or of a crust of condens'd wax adhering to it, after what has been already said, it is to no purpose to add any thing more: nor yet of the fifth; for it is very evident, that if an excrescence of flesh stops up the meatus, the hearing must be intercepted, unless it be remov'd. And in what manner this is to be perform'd, many teach us; amongst whom, beside our Marchetti (*f*), the chevalier who gave the faculty of hearing to a young man thus born, in the first place is Du Verney (*g*), who also has related the manner of taking out other things, which injure the hearing and the ear, by having fall'n deeply into the meatus auditorius, the incision of the ear, where necessity compels, not being omitted. Paulus, indeed, as you have it in our Fabricius (*b*), and Albucasis, as you have it in Marcellus Donatus (*i*), propos'd the same operation formerly, but in a different place, as it seems, which perhaps might be more convenient for inspection, and for action; but that of Du Verney is more safe. And as to what Donatus has subjoin'd, concerning a pea slipping into the meatus auditorius, it would be no uncommon case here, if we were not to look to it in the beginning. But as it happens very often, that by introducing instruments to extract these substances, they are push'd still farther within the meatus; a surgeon, who was an acquaintance of mine, by pursuing quite a different method, in many persons, very happily remov'd them. For he threw with force into the meatus, by means of a syringe, oil of sweet almonds, or milk; and by this means the peas, or other such seeds, were brought back by the regurgitating fluid, and discharg'd from the auditory tube. And when I said, that the rationale of this practice was before led to by Celsus (*k*), who at that time, "threw water "in forcibly with a syringe," but at the same time objected to him the admonition of Scultetus (*l*), who forbids the violence of injections in disorders of the ears, "lest the membrana tympani be ruptur'd;" he answer'd, that he had never yet observ'd, in any one of those children, on whom he had made use of the method I have told you, of getting heterogeneous substances out of the ear that had fall'n in, any the least detriment to their hearing im-

(*e*) n. 11. (*f*) *Obs. Med. Chir.* 28.

(*g*) *Parte sæpius cit.*

(*b*) *De Chirurg. Operat.*

(*i*) *De Medic. Hist. Mirab.* l. 2. c. 12.

(*k*) *De Medic.* l. 6. c. 7. in fin.

(*l*) *Arman. Chir. Tab.* 36. ad Fig. 5.

mediately,

mediately, or at any time after. However, that no one may be compell'd to descend to injections, that are thus suspected, or to incision, which is not at all approv'd of by Fabricius (*m*), unless in the most rare cases, not only many different things propos'd by surgeons, should be previously put into practice, but especially, that whatever substances have fall'n in, may not be forc'd on farther by introducing instruments, but may be more easily laid hold of, and taken out, it will be of much advantage to use that easy method by which Fabricius was wont to straiten and dilate the meatus, as far as it was possible for him to do it; and when it was thus straiten'd and dilated, to examine it very accurately, by admitting the light of the sun; at the same time transferring hither, from the nostrils, the custom of Julius Cæsar Arantius (*n*); who, "when the heat of the sun was troublesome to the patient, the physician, and the attendants, especially in a very hot state of weather, for that reason invented, in a close wooden window, an artificial foramen, that was most proper for performing that office; so that the rays of the sun, insinuating themselves by this foramen, might come directly to the nostrils of the patient." But as the sun does not always appear, it may also be of service, if a better apparatus is wanting, to make use of the light of a candle by night, or if it happen in the day-time, to darken the room, and to let the light pass through a globe of chrystal fill'd with water, so that the greatest part of its rays may fall upon the meatus auditorius. Therefore, by either one or the other of these methods, which are sometimes the most convenient, to throw a light upon other recesses also, as of the mouth and fauces, especially by night, one of the parietes, at least, of the meatus being enlighten'd, on the side of the surgeon; the opposite paries will, consequently, be better examin'd into by means of the reflected light; the substances that are fall'n in will be better perceiv'd, and more certainly laid hold of; and thus may they be happily drawn out, instead of being hastily driven inwards.

14. Concerning the two remaining observations, it is sufficient to say a few things. In the sixth a reason is propos'd, why more persons should be depriv'd of their hearing, from their birth, than of any other sense whatever, discover'd, as it is said, from the origin of the nerves. But although we should grant to Bauhin, from whom those things are taken, which we ought by no means to grant, that the *portio mollis*, of the auditory nerve, arises from the cerebellum, and passes through the pons Varolii, or the annular protuberance; it would, nevertheless, by no means follow from thence, that, although it does not take a long passage, "it is easily fill'd with mucous excrements." But as to what Bauhin immediately adds, "that hence it also happens, that both ears are always affected from the birth, as Cassius has taught, whereas it happens, for the most part, that one only is affected from disease," neither has Cassius ever taught this, that I remember, nor does he so much as in the least suppose it, in the seventeenth problem, which is quoted by Bauhin in his work, but even quite the contrary; nor indeed would it be necessary, that both ears should be "always" affected from the birth, notwithstanding both the soft portions of the auditory nerve should

arise from the annular protuberance, unless it were certain, that both of them were not only contiguous one to another, in the very origin, but that even the disorder was always in that very same origin. And in this very manner I should answer, if any person who now attempted to explain the same thing, by substituting the more real origin of the nerves, in the place of that, which was suppos'd in Bauhin's time, should say that it seem'd in this new origin, which was at length known to the more modern anatomists, that both of the portions were contiguous to each other, to wit, in the middle of the calamus scriptorius. You will perhaps wonder here, that this is by me ascrib'd to the more modern anatomists, which I formerly (*o*) attributed to Piccolhominus, and others not only attribute to him at present, but also to Varolius, and even to Gabriel Zerbus. But if you read over the passages of both authors, that are refer'd to by them, and inspect figure the first, in the first author (*p*), you will see that Varolius deduces the auditory nerves from his own pons (*q*): and if you turn to Zerbus (*r*), you will find him writing, indeed, that these nerves "run together, and are united at their origin;" and also, "that the optic nerves have a similar union at their origin;" beside that other union, "about the middle of their descent;" so that you must immediately understand these unions in the origin, not to have been describ'd from the sight, but ingeniously devis'd: and, indeed, when he was speaking above of the optic nerves (*s*), he affirm'd, in general, "that all the pairs of these nerves were united at their origin;" and when he was speaking of the acoustic nerves, of which the question is at present, he affirm'd (*t*), "that they arise from the anterior ventricle."

But if I had compar'd these words of Piccolhominus, in which I said he "seem'd to have shadow'd out" what Willis afterwards shew'd, with those things which he had written (*u*) on the origin of other nerves also, and had delineated in the figure join'd thereto; I should have said, that he seem'd to have done it indeed, but had not really done it.

Finally, as to what we read in the seventh observation, of an acuteness of hearing, proceeding from the auditory nerve being threefold, on each side; I should more readily believe it, if either some very skilful anatomist was nam'd, who had seen it, or I myself (*x*) had not observ'd, that each of the portions of the same nerve were frequently dissolv'd into fibres, by the very touch, or by a slight motion: and the mollis sometimes "very easily into two or three thicker nerves," while the brain is lifted up, and these portions cut through.

15. Although I have, hitherto, mention'd many causes of injuries in the organ of hearing; yet take care how you suppose that I have touch'd upon the greater part of them. For the "organ of hearing is," as Boerhaave excellently says (*y*), "the most compounded among all the organs of sense;" for which reason, "there are a greater number of parts in it, than in any other; and these parts may be injur'd, and hurt, in the most different

(*o*) Advers. Anat. 6. Anim. 27.

(*p*) Ad litt. b. & i.

(*q*) De nervis Optic. Epist. 1.

(*r*) Anat. tot. corp. hum. in Anat. Aur.

(*s*) in Anat. nerv. Optic.

(*t*) in Anat. nervor. quinti Par.

(*u*) Anat. Prælect. 1. 5. Lect. 5.

(*x*) Epist. Anat. 12. n. 28.

(*y*) Prælect. in Instit. § 563.

“ways;” so that, as he affirms in another place (z), deafness “is one disorder, “but appears in a thousand shapes,” which the great number of causes that he (a) and others produce, in the list of those that injure the faculty of hearing, sufficiently proves. And it is not to be doubted, but this number may be every day increas’d, as for instance, when innumerable membranes, drawn from all sides, and intersecting each other mutually, occupy the whole cavity of the tympanum; as I found in that ear (b), in regard to which, marks were not wanting, that the man had not heard at all, or at least, very little; and in like manner, when any muscle out of those, which serve to the motion of the little bones, in the tympanum, is immoveable, and contracted, as I found in another man (c), who when he was alive, if any one could have divin’d, would not, I believe, have been interrogated to no purpose at all, concerning the certain disorders of that ear. But it is not at all to be wonder’d at, that among so many other disorders, common to all muscles, which are mention’d by a few, whom I have before commended, Boerhaave necessarily omitted some, and after the disorders enumerated by him, said that “a great number” still remain’d. You will also see, that many, and various, causes of deafness are confirm’d in other writers, by examples produc’d, the greatest part of which are either the same, or of the same kind, with those I have mention’d above. But I could wish that they had had opportunity of examining, by means of that shrewd judgment which they are masters of, all these examples, and enquiring, whether each of these appearances was really seen, by the authors whom they quote; and if they were really seen, whether they were really the causes of deafness. In making this enquiry, they would have observ’d, moreover, that some things were not spoken of at all, in some of the books they have pointed out, or not spoken of in the manner they have represented. For Vallalva, to speak of him alone, for example’s sake, did not deduce deafness from the injury of the muscles of the tube, but from the injury of the salpingostaphylini muscles. he deduc’d “a heaviness of hearing;” although I (which relates to the examination of this cause) did not even find, that this heaviness of hearing had been in him (d), who had not only an injury of those muscles, but had also “the *pallatum molle* consum’d.”

But to return to Boerhaave; he excellently well judges (e), that the cause of deafness is often from the lues venerea, by bringing on a concretion of the Eustachian tube, which frequently is the consequence of a cicatrix, that remains after eroding ulcers of the fauces. But to the “paralytic disorders,” which he points out (f), of the small membranes, or nerves, of the “vestibulum, labyrinth, and cochlea,” (instead of which this expression is elsewhere (g) made use of, by a typographical error, “the spiral cavities of the tympanum”) to these disorders, I say, or to disorders of that kind, may be refer’d, I believe, that deafness, with which an old, and infirm dog had been troubl’d, for the space of three years together, which was at length remov’d

(z) Ad § 608. 850. & seqq.

(a) Epist. Anat. 5. n. 26.

(b) Ep. Anat. 6. n. 22.

(c) Ep. An. 7. n. 15.

(d) Epist. Anat. 9. n. 9. 10.

(e) Prælect. cit. ad § 852.

(f) ad § 850.

(g) ad § 563.

by the transfusion of blood, as his debility was at the same time (*b*). Thus far of the disorders of the ears.

16. Of the affections of the nose in the next and twentieth section of the Sepulchretum, the first is, "the loss or privation of the sense of smelling:" under which head six observations are produc'd: although in the third and sixth, which seem to be one and the same, no mention is made of this affection; nor yet in the foldier, who is spoken of in the fifth. And if you should, perhaps, be willing to compare the third observation with its original author, you will not find any more of it there; but you must look for it in the *Dissertatio Anatomica* of Rolfinc, book the second, chapter the nineteenth, not the twentieth; as you must also look for the second in the book of Schneider *De osse cribiformi*, not page one hundred and eighteen, but five hundred and eighteen. However, if those things were to be taken for granted, without any hesitation, which are advanc'd concerning the defect of the olfactory nerves, in those who suck or chew tobacco, upon which subject Schneider doubts, in page five hundred and three, it would be natural to suppose, that the sense of smelling was also wanting: which sense, I firmly believe, was not equally strong in both nostrils, in an asthmatic person whom I dissected. For he had the process of the os ethmoides, which is call'd crista galli, so obliquely situated, and at the same time so form'd, that it render'd the seat of the little foramina, through which the fibres of the olfactory nerve pass into the nose, so much the narrower on one side, as it was broader in the other; for which reason, there was a less number of these kind of small foramina on one side, than on the other. But this unequal distribution of the nervous power of smelling, is a more rare cause; and that is more frequent, as I formerly observ'd also (*i*), when the septum nasi is bent very considerably to one side, in some persons; so that it prevents the odoriferous particles from penetrating so high, or extending so far, on the side to which it inclines. And as this circumstance does not rarely occur, in the dissection of the nose; let surgeons take care, lest in examining into, or curing, the hidden disorders of the nose, they also believe that to be always from the present disease, which is often owing to another cause, or, perhaps, is so from nature itself; and, in like manner, let them not always expect to find an equal quantity of space in one cavity of the nose, as in the other; nor be deceiv'd by those, who, not having attended to this variety, absolutely say, "that the nose is divided " into two large equal cavities by a septum lying between."

Opposite to this is another error; I mean, the error of those who say, that the septum "is always inclin'd to one side or the other, except in children." As I have been very much vers'd in this part of anatomy, I have happen'd to see many septa more or less curv'd; but I have also seen many without any curvature, or inclination, and even in the bodies of adults: so that, though I do not deny, but the increase of the septum itself being much faster than that of all the other bones of the upper jaw, may be one among the causes of this mal-conformation, by which it is of necessity curv'd; yet that this happens in all, neither reason, nor observations, suffer me to believe.

(*b*) Act. Philos. Soc. R. in Angl. a. 1668.
m. Decembr. n. 2.

(*i*) Advers. Anat. 6. in calce Explic. tab. 2.

And I find also, that the celebrated Leipzig professor, Quelmalzius (*k*), did not believe it more than I; since, when he was recounting so many other causes of these incurvations, which he had conjectur'd, or observ'd, he did not so much as mention a single word of this. You will not repent of your reading them, nor yet the detriments, troubles, and impediments, which, he thinks, have their origin from this conformation. Many of these causes I acknowledge, as well as he; and as to the consequences of the curvation, I not only believe that they may happen, but that even other disorders, whether of the head or eye, or even of the lachrymal passages, which I see are produc'd by others, may also happen therefrom, provided the incurvation of the septum is very considerable: and I moreover believe, that from these consequences, without any apparent cause, very long and very obstinately teasing the patient, surgeons may be at length induc'd to conjecture, and enquire into, the curvation of the septum, in a patient whom they have undertaken to cure. For their sakes, I should believe also, it ought not to be entirely omitted, that sometimes this variety may happen, which I lately observ'd, while I was demonstrating the interiors of the nose of a certain old woman, to my auditors. The septum itself was inclin'd neither to one side, nor the other: but below the middle of its perpendicular diameter, somewhat nearer to the posterior than to the anterior part, a small portion of it was hollow'd, on one surface, and on the other convex; and that so much the more, because in this part a kind of bony ridge, running obliquely, rais'd the surface of the septum, so that it almost became contiguous to the os turbinatum, that was opposite to it. This was a small portion, as I have said; yet not likely to give, for that reason, but little trouble to the surgeons. The anatomist, certainly, leads them into danger of errors and mistakes, who describes every thing as being perpetual, and constant, in those parts that are less expos'd to the eye; and he, therefore, is more useful, who shews what things may very frequently, or sometimes, vary.

17. But now, omitting those questions, which do not much relate to our present purpose, although they are propos'd in the seventh observation, and the scholium added thereto, in the Sepulchretum, whether the membrane of the frontal sinusses serves to promote the sense of smelling, and whether odours are sometimes inherent therein for a considerable length of time, as in that example which you read in the book of Schneider, already commended, not in page one hundred and twelve, but one hundred and twenty-two, and the following pages, the more certainly to shew you, that the smell of a morbid body, yet not "a mortal disease," as you will read elsewhere, had been inherent in the nostrils of a merchant, for one and twenty days; these, therefore, being omitted, as to what relates to the polypi of the nostrils, that are mention'd in the next observations, it were to be wish'd, that in the scholia, which are subjoin'd to the ninth observation, their nature and origin were not refer'd to those polypous concretions, which are frequently seen in the sinusses of the dura mater; although this is at length added, whether the one and the other "are of the same nature, must be the subject of a

(*k*) Progr. de Narium, earumq. septi incurvatione.

“ farther disquisition.” But the polypi of the nostrils themselves, have not only a different nature, but a different situation from each other. A different nature, certainly, as you see in the celebrated Palsin (*l*), in regard to that, which, being form’d of a condensation of humours, distending the internal membrane of the nostrils, to the bigness of a pidgeon’s egg, was laid open from the upper to the lower part, and by these means cur’d: and in regard to those mention’d by Ruysch (*m*), which, “ being wrapp’d up in a membrane, consist of a slimy and pituitous substance:” but above all, in respect to that which I have observ’d in the Sepulchretum; not, indeed, in this section, but in that which is entitled “ *De catarrho (n)*”, and is describ’d to be like “ an oblong bladder, full of serum, membranous, and often hanging far out of the nose, and to have been emptied now and then by a serum discharging therefrom.” For these have a far different nature, if they are, indeed, to be reckon’d among the true polypi, from those which are made up of a substance, of a middle nature, betwixt a glandular and a fleshy body. I made use of these words, ‘ If they are, indeed, to be reckon’d among the number of true polypi,’ for this reason, because that censure of Mauchartus (*o*), “ The pituitary membrane of the nostrils has been observ’d, sometimes, to have fall’n down” (that is, to have suffer’d a prolapsus) “ in phlegmatic subjects, so as to have impos’d upon the ignorant and unskilful for a polypus,” falls upon some, if not of those that are just now describ’d, yet, at least, of those that are not unlike them. And it is manifest, that they which are mention’d by Slevogtius (*p*), have not entirely the same nature with the true polypi, inasmuch as “ they have been seen cartilaginous, or, in process of time, bony, or approaching to the nature of a stone, and, “ if it can deserve credit, even of a woody nature, by Job Van Meekren.” But if you read over the chapter of this author (*q*), refer’d to by Slevogtius, you will perceive, that the polypus was not woody, but that the polypous excrescence contain’d “ a bit of wood in the middle,” thrust privily by the patient, who was a boy of three years old, into the nostrils, which had been the cause of the excrescence, and of the suppuration. So also, in regard to that polypus, which the ancient author of the second book *De Morbis (r)*, amongst others, thus describ’d: “ It seems, indeed, to be flesh; but, if “ you touch it, it gives forth a sound, like a stone:” although Salius thinks (*s*), that it was a cancerous polypus; will you believe that it was a cancerous polypus, as Slevogtius seems to have shewn, which only approach’d to the nature of a stone; or rather a polypous excrescence, which contain’d a hard calculus, or calculi, by embracing them loosely? For that calculi have been discharg’d from the nostrils, “ of the figure and bigness of dates,” Thomas Bartholin has asserted (*t*); to omit others, of a less size, observ’d by other authors, as by Khernius (*u*), and by Riedlinus (*x*); the last of which,

(*l*) Anat. du corps hum. p. 2. tr. 4. ch. 14.

(*m*) Obs. Anat. Chir. 6.

(*n*) L. 1. f. 17. append. 1. ad obs. 10.

(*o*) Dissert. de Hernia incarcer. c. 2.

(*p*) Diss. de Polypis capitis, § 29.

(*q*) Obs. Med. Chir. c. 14.

(*r*) N. 34. apud Marinell.

(*s*) Comment. in hunc locum qui ipsi est text. 68.

(*t*) Cent. 1. Hist. Anat. 33.

(*u*) Eph. N. C. Dec. 3. a. 5. & 6. obs. 46.

(*x*) Dec. ead. a. 9. & 10. obs. 145.

a surgeon, having introduc'd into the nostrils "an instrument, which struck " against some hard body," laid hold of with the forceps, and continu'd to pull at them so long, till he extract'd them.

Last of all, if a polypus is not only said to have been, in some measure, cartilaginous, but, in process of time, bony; for in our chevalier Marchetti (*y*), and others, I have read, that polypi, sometimes, " grow callous, almost to " the hardness of a bone; and I know, that when Meekren (*z*) was endeavouring to extract a polypus, of a cartilaginous hardness, " his forceps were " broken, although they were otherwise very strong;" if, therefore, not what approaches in hardness to a bone, but what really is a bone, is to be call'd a bony polypus, as that which is spoken of by Slevogtius (*a*), I should rather chuse, with him, to consider it as an excrescence of the bones of the nose (*b*), than as a polypus.

And it is very evident, that different polypi have different situations, in respect of their origins. For Ruysch (*c*) saw them more than once inherent in the maxillary sinus, from which they sometimes proceeded, through the excretory foramen of this cavity, into the nose; as a surgeon, whom Palfin mentions, was witness to (*d*): and this author very justly imagines, that they may be produc'd from other sinusses of the nose also, although it seems much more easy to me, for them to proceed from that in which I said they have been found, I mean, the maxillary, for this reason; because the exit of the mucus, from that sinus, being more difficult, on account of the situation of the sinus itself, and its excretory foramen, stagnation may give such an acrimony to the mucus, particularly in some bodies, that it may erode the membrane with which the sinus is internally invested, and from thence give occasion to the beginnings of a polypous excrescence. Boerhaave (*e*), however, thought, that polypi began from the pituitary sinusses, in a far different manner; the mucus being, as it were, inspissated, so that it could not get out, " at " length the whole sinus is fill'd, and the membrane of the sinus, drawn out " through the orifice into a pedicle, hangs forward into the cavity of the " nostrils." Which manner I should be much more likely to understand, if it were said, that the mucus had intruded itself, and been collected, betwixt the bony parietes of the sinus, and that membrane, which was in some place or other destroy'd by erosion; that so at length, by the pressure and urging from behind, the membrane might be forc'd out from the orifice.

But the origins of polypi are much larger, and much more frequent, on the outside of the sinusses, where the pituitary membrane is thicker, and more manifestly glandulous. For that they arise from this membrane, you will even sufficiently conceive from hence, that they are produc'd therefrom, even when it is extended on the outside of the nostrils. Thus, in the *Acta Helvetica* (*f*), you will read, that a long and thick polypus proceeded, not from the nostrils, but from the fauces. Thus, in the *Commercium Litterarium* (*g*), you read, that a polypus, which had suffocated a man, was found

(*y*) Obf. Med. Chir. 27.

(*z*) Obf. cit. c. 12.

(*a*) Disp. cit. § 9.

(*b*) Ibid. § 13. (c) Obf. cit. 77.

(*d*) Tr. cit. ch. 15.

(*e*) Prælect. cit. ad §. 498.

(*f*) Vol. 1.

(*g*) A. 1731. specim. 45. n. 4.

adhering, not only to the bone of the vomer, but also to the neighb'ring aditamentum of the os occipitis, that is, to the roof of the pharynx. But from the same membrane, which invests the parts just now spoken of, that polypi much more frequently proceed, where it covers over the internal parietes of the nostrils, or the protuberances thereof, I said just now, was very well known; yet I will subjoin some observations thereupon, not so much to confirm this opinion, as that you may know what Valsalva and I have seen relating thereto.

18. A certain man had polypi growing out from each nostril. The cavity of the right nostril being laid quite open after death, two polypi were found, one hanging from each of the spongy, or turbinated bones. Their origin was from the glandular membrane of these bones, so evidently, that the nearer they came to this membrane, so much the more did they shew a glandular nature; and the more they receded therefrom, the more did they degenerate from a glandular nature. Nor were the appearances in the left cavity of the nostrils much unlike to these.

19. As I took that observation from the papers of Valsalva, so I had this from his own mouth, that as he could not be certain by any other means, that the whole of a polypus was entirely cut out, by his knife, he had not hesitated to take away, at the same time, a lamella of the part to which it adher'd, lest it should shoot out again; for that nature had easily cur'd it, and the operation had succeeded very well. I am not ignorant, that when a polypus was cut out in the presence of Ruysch (*b*), and "a cartilaginous portion follow'd, together with the polypus," this did not seem to him "laudable, but that it was better to extract the polypus, with a portion of the interior tegument." Nevertheless, what Valsalva had seen, and what had succeeded with him, I did not think proper to conceal. But it is to be wish'd, that it were rather possible to follow the method which was practis'd by the celebrated Heister (*i*), with good success, on a noble woman; or when that is not possible, at least to beware of the fatal examples of the lacerated trunk of the nasal artery, the principal feat of which Heister has, for that reason, pointed out (*k*): and the very excellent Haller (*l*) has describ'd this artery, as he has done the other arteries, with the greatest precision and exactness.

20. But I, in order to return to the promis'd observations, once found the beginnings of polypi, and those in the internal nostrils of a certain insane man, of whose brain I have written to you in another place (*m*). You already know, that at the lower border of the turbinated bones, some peculiar and red thicknesses of the membrane of the nostrils, are found in pretty great number, which I have remark'd in a former work (*n*), and consider'd as glandular parts. But in this insane man I saw that these thicknesses, where they lay on the lower part of the inferior turbinated bones, had grown out into very lax caruncles, which hung one from each of those bones. And

(*b*) Theat. Anat. 3. n. 80.

(*i*) Instit. Chir. P. 2. S. 2. c. 71. n. 7.

(*e*) Dissert. de Anat. maj. in Chir. necess. c. 1. n. 2.

(*l*) Ad Prælect. Boerhaav. in Instit. §. 494. not. *e*.

(*m*) Epist. 8. n. 11.

(*n*) Advers. Anat. 6. Anim. 88. in fin.

upon cutting into these excrescences, in any part whatever, I found them to be so constructed, that between a white net-work, or, if you please, betwixt white cancelli, red areas seem'd to be contain'd: which appearance confirm'd the glandular nature of these thickneses, and at the same time shew'd the origin of these polypous caruncles to be glandular. And to this perhaps must be referr'd, what I observ'd in two other men, but in different situations, and with different appearances. For in one of them, at the upper part of the nose, three or four flattish verrucæ, bordering one upon another, occur'd, the substance of which, as far as I could judge from their depress'd situation, seem'd fungous. These were, if I remember rightly, in one cavity of the nose near to the foraminulous lamina of the os ethmoides, and in the septum itself. But in the other man, who was the dropical person, in whom I observ'd that the right lachrymal duct had coalesc'd (*o*), as I search'd for the orifice thereof in vain; I found that the surface of the inferior turbinated bone, which us'd to lie opposite to the orifice of this lachrymal duct, was almost universally, and especially towards the inferior part, beset very thickly with tubercles, of the form and magnitude of the grains of millet-seed, except that some of them were a little larger, resembling glands by their cineritious colour, and by the humour, which, when press'd, they emitted in large quantity. This humour was thin and inodorous, like water: and the tubercles, when dissected, although they decreas'd in bulk, yet were by no means obliterated; but in great measure preserv'd their own substance, which was of the same colour with, and bore great resemblance to, that of which the pituitary membrane consisted. Wherefore, although the orifices no where appear'd conspicuous; yet I did not doubt, but these tubercles were no more than encreas'd glands, some of which, as they were naturally bigger than others, might, by being distended from the encrease of their contain'd humour, easily degenerate into caruncles. But in neither of these men, although I examin'd all the other parts of the interior nose, accurately, could I find tubercles, or verrucæ, in any place, except where I have mention'd.

21. Before I quit the last scholium of the ninth observation, where a vessel is said to have been found out by Steno, from which even the fluxes of the nose are accounted for; I could wish that others could find it in the human subject, of a bigness equal to that of which he found it in sheep (*p*); that is to say, "capable of admitting a probe." Nor indeed do I say it, for this reason only, because, by that means, the observation of Salmuthus might be more fully explain'd, who saw the nostrils "flow with a thin pituita, for " the space of three whole days, in the same manner, as in other persons, " they flow with blood, but at intervals," as you will read in the Sepulchretum itself (*q*). But I say it chiefly on account of a much more rare discharge, which happen'd in a very fine Venetian woman, for whom I was consulted in the year 1745, about the latter end of June. For from the time that she had been troubl'd in the winter before, with a coryza, and a frequent acrid stillicidium from the left nostril only, she had continu'd still to be harass'd with the same discharge, though 'it was now many months after all other symptoms of disease had been in a short time remov'd; and even then the

(*o*) Epist. 13. n. 27.(*p*) De Glandul. n. 8.(*q*) Sect. 17. Append. 2. ad obs. 10.

flux still continu'd, always from the same nostril, and nearly in the same manner as at first, except that the marks of acrimony having left her, at the same time with the coryza, afterwards drops, like the most pure fountain water, fell from the nostrils so fast one after another, that they amounted to the quantity of half an ounce every hour, when the patient did not lie down; for when she lay down, the flux was diverted to the posterior foramina of the nostrils, and discharg'd by them into the fauces, in much less quantity, as far as we could conjecture. And now the habit of the patient, which was naturally full, began to be extenuated, the remedies which had been applied, both internally and externally, in order to diminish this stillicidium, by the most excellent physicians, having had not the least effect.

However, what could be much more easily understood, by means of one larger canal, whose orifice was relax'd, was explain'd by means of a great number of smaller vessels, whose mouths were suppos'd to be preternaturally open'd, and to discharge their contain'd fluids, before, by a proper remora, some of the aqueous particles flew off, and others return'd back into the blood; and such medicines were first recommended, as by inviting the humour to other parts, reliev'd the membrane of the nostrils; and after that such regimens, as by degrees restor'd the power of retaining this fluid, both internally and externally, especially by proper fumigations cautiously applied; this method of cure being concluded upon, and drawn by analogy, from those methods which are of the most advantage against other similar disorders; as for instance, by comparing the fluor uterinus, which is the most frequent, with this, which is very rare.

I afterwards heard that the discharge diminish'd so gradually, as to continue many months, till at length, within about the space of a year, it was entirely stopp'd. A much more considerable discharge than this you will read of in Bidloo (*r*), inasmuch, that "in the space of twenty-five hours, "about twenty ounces of the most clear water distill'd from the right nostril." But this happen'd from a very violent and external cause, that is, an injury of the same nostril, from whence an ulcer, although very slight, had occupied the whole internal surface; and as the humour soon became thick, and turbid, the tents that were introduc'd were found, when drawn out, to be cover'd over with pus. And after this, medicines being applied to the internal surfaces by means of these tents, or thrown in by a syringe, the flux was soon restrain'd thereby: nevertheless the patient, after so many vehement symptoms in the beginning, and in the course of the disease, died within seven or eight months.

22. Next in order come four, or rather three, observations of sanious or foetid matter, being discharg'd from the nostrils. For the tenth and thirteenth are so evidently the same, that it is amazing the sameness should never have been regarded, when only two observations are interpos'd. But that the fomes of excretions of this kind existed within the cranium, though it might formerly be believ'd, cannot be believ'd now. However, although it is evidently shewn in the eleventh observation, that the pus which was discharg'd from the nostrils of a dying man, had flow'd thither from the

lungs; yet it is not certain, by the twelfth observation, that what proceeded from the nose of a lethargic boy, had descended thither from an abscess of the brain; which is already sufficiently hinted to you in my sixth letter also (*s*), where I had before my eyes, even the history of this very boy, which is given you above in the Sepulchretum (*t*), and compar'd it with that of another boy.

But if you should require still more; you may in the fifth letter (*u*) read over again, that I saw no signs of pus within the cavity of the cranium, in that body, from the nostrils of which the purulent matter had flow'd. And you will see that Palsin (*x*) is of the same opinion, and that he, moreover, deduces excretions of that kind immediately from the pituitary sinusses. And from the same source, or rather from the other recesses of the nose, you will perceive that Fernelius deduc'd them, in that passage, which is quoted in the fifth observation of this section: "About these parts sometimes abscesses happen, without any fever, and with very little pain, from which, when ruptur'd, I have observ'd a perfect pus to flow down plentifully, through the nostrils, just as frequently happens from suppurated ears, and that without any inconvenience to health." For who can believe, that such a man had said these things concerning abscesses relating to those parts, which he had last mention'd; I mean, "the anterior ventricles of the brain, and those nervous branches in which is the sense of smelling?" At least he did not say, in these parts, but "about these parts." But if Palsin (*y*) says, that by a suppuration happening in the pituitary sinusses, "an intolerable pain is brought on," which is also confirm'd by the observation of Henr. Alb. Nicolaus (*z*), especially as he says, that he twice found an abscess in the frontal sinusses; how much more would Fernelius have judg'd, that the same must happen from an abscess in the meninges, with one of which these branches are invested within the skull, and upon the other of which they lie; for by these branches he meant also the same (*a*), that we now first call the conjunction of the nerves: and to say nothing of pain, how could there be no fever at such a time? no inconvenience to health? Certainly these things could hardly be suppos'd of abscesses which happen in any part of the nose, that has only a more dull sensation.

And that the sanies of ozenas, not only proceeds from other parts of the nose, but also from the sinusses themselves, sometimes, and especially from the maxillary, Drake (*b*) has shewn; but, if I remember rightly, from the observations of Cowper, which have laid open the very disorder itself, and the method of distinguishing it from others, and in how easy a manner medicines may be introduc'd into these very sinusses themselves, not without great praise to anatomy, from whence all these advantages are drawn. For if the antient surgeons, as you have it in Celsus (*c*), taught that the nose should be cut open, that their remedies might be able to reach to the seat of a far less conceal'd ozena, and afterwards be sew'd up; anatomy has now taught a

(*i*) n. 5. (*t*) Sect. 3. obs. 34.

(*u*) n. 19.

(*x*) tr. cit. supra ad n. 17. ch. 15.

(*y*) Ibid.

(*z*) Dec. Obs. III. Anat. Obs. 10.

(*a*) Vid. Physiolog. l. 1. c. 9.

(*b*) Anthropol. book 2. ch. 10.

(*c*) De Medic. l. 7. c. 11.

much more expeditious and desirable method, to come at the most conceal'd and internal of all. But whether Jo. Henr. Meibomius found out the same method of cure (which I now read for the first time in a certain *programma* (d) of the most learned Gunzius, while I was revising this letter), and Henry his son put into practice, let others judge. For I observe, that besides the exit given to the matter, from the maxillary sinus, by the sockets of the teeth, that have been extracted, none of the other things, which are from Cowper, are produc'd, as if equally known to the Meibomii: and, indeed, Gunzius partly confesses it, by whom you will also not unwillingly acknowledge, that many things are added, which tend to make the cure more compleat. But how these things that have been said may be transferr'd to the frontal sinusses, you will of yourself understand, if you attend to the situation of them, and the trepanning upon them, which is propos'd by Palfin (e), in the case of suppuration that happens there; which is a circumstance not much to be desir'd, and might have its own inconveniences join'd with it, as Palfin himself, a little before, shews: but yet far greater inconveniences, and even death itself, have oftentimes been brought on by an uncur'd ozena, and a caries consequent thereon. But where an ulcer of the nose was on the outside of the sinusses, and it was not certain to what parts it extended at all, and how far it extended, I remember that Valsalva, whatever innocent remedies he injected, injected them always by a pipe, the head and the upper part of the sides of which were every-where pierc'd through with foramina; so that no part was without being sprinkl'd. He also, when the septum nasi was corroded by an ulcer, and began to subside, endeavour'd at once by internal and external remedies, that the ulcer might be stopp'd in its progress; and, at the same time, introduc'd thin tubuli into the nostrils, of such a size and form, that the *alæ nasi*, when they began to collapse, might be supported thereby, as far as it was possible, and recede less from their natural figure.

23. The observations that follow, relate to the hæmorrhage of the nostrils. Some of them have reference to the cure, nor are taken from the dead body: and others were made upon the dead body, but not where they ought to have been chiefly made; I mean, in the nose. Wherefore, I shall subjoin only a very few things, which relate to each of these kinds, beginning with the second. That a disease of the viscera, and especially of the liver and spleen, is join'd with frequent and large hæmorrhages of the nostrils, the fourteenth and sixteenth observations confirm; besides others, which you may add, and especially one of Maurice Hoffman (f). Nor is it to be wonder'd at; for whether these disorders precede the effusion of blood, and thus pervert its nature, and distribution through the body, so that, as it is carried with more difficulty through the belly, it is carried more easily, and consequently more copiously, through the upper parts, and at the same time, on account of its watry or acrid disposition, very easily finds or makes an exit for itself in the nose; or whether these disorders succeed to the effusions of blood, many things will flow together plentifully into the channel of the circulation, by

(d) Editio. a. 1753. in quo obs. ad ozenam.
Maxillat. pert.

(e) Ch. 15. cit.

(f) Eph. N. C. Cent. 9, & 10. in append. I.
obs. 5.

reason of the resistance being diminish'd, which, on that account, do not repair the loss of blood that has been made, but injure what remains, and render it more inert and thick, and so much the more easily prone to obstruction, because good juices cannot be secreted except from good blood, in order to prepare a good chyle. Wherefore, the taint of these viscera is sometimes the cause, and sometimes the effect, of these hæmorrhages; and although what was before the effect may become the cause, yet it is never the proximate, but the remote cause.

The proximate cause would, in fact, be that erosion of the vessels, which Boscius says, in the fifteenth observation, "he had observ'd in the dissection" of persons who died of the hæmorrhage from the nostrils; if it were certain, that he spoke of the vessels in the cavity of the nostrils: for, as to what he seems to say of the beginning of the venal sinus, which is call'd the superior of the salx, that beginning is certainly not extended within the nostrils; so that although the same cause, by which the vessels within the nostrils are eroded, might frequently have been the cause of erosion also in this sinus, yet it is impossible, that the blood extravasated from thence can descend, from the cavity of the cranium, into the cavity of the nostrils, in a well-constituted head; as is evidently demonstrated from Schneider, not only in the scholium subjoin'd to that observation, but chiefly in that which goes immediately before, in the second appendix, in opposition to many otherwise great men, who have deduc'd the nasal hæmorrhage from this sinus. Who these were, you will know, by inspecting the book itself; and you will also see, that many things are not faithfully represented, even among the words of Schneider, and others omitted, which the reader would not have suspected.

24. But although the observation of Valsalva, which is spoken of even at this day, in Bologna, with praise, was not made on the bodies of dead persons; I think it ought, nevertheless, not to be omitted here, since even in the Sepulchretum, as I said before, observations are produc'd, which relate only to the *methodus medendi*, as the first in the appendix does.

A nobleman, who, in order to strengthen his joints, had made too free use of the mud of the baths near Verona, began to be subject to a nasal hæmorrhage, which return'd so often, that every week he lost a greater or lesser quantity of blood; and sometimes the hæmorrhage was so large, that it left behind it a great dejection of spirits and strength, and a weakness of the head. For the space of four years, or more, things were in this state; and although he resided, during these years, as his office requir'd him to do, (for he was one of the first ministers to a certain great court) in many of the chief cities in Europe, where he had not only the advice of the physicians who were present, but had also the opinion of others by letters, yet all were in vain. At length, having return'd into his native country, he sent for Valsalva, at the time when a very great quantity of blood was flowing from his nostrils. What had happen'd to this nobleman was already known to Valsalva, inasmuch as he was in the number of those physicians who had been consulted by letters. But it seldom happens, that physicians, by reading written cases, sent from patients, conceive just in the same manner of them, as they would from seeing them; and thus it happen'd in the present case. For Valsalva having observ'd, that as often as ever the patient wip'd his

nose, or touch'd it with his hand, the flux of blood, which had before remitted, was again encreas'd; and having call'd to mind, that he had generally seen, in dissections, the blood-vessels extremely turgid about that part where the *alæ nasi* are join'd with the bone, about a finger's breadth, more or less, from the bottom of the nostrils; he began to suspect that the blood then flow'd from those vessels. Wherefore, introducing his finger, he press'd that part, and the blood immediately ceas'd to flow; so that it was not even discharg'd by the posterior nostrils into the fauces. And by this easy kind of remedy, which always answer'd afterwards, the patient, who had learn'd to make use of it himself, at length got quite rid of the returns of the hæmorrhage, within a few months (*g*).

25. This successful method of treatment, which Valsalva made use of, shews, that tents, or dossils of lint, introduc'd into the nostrils, in order to restrain the hæmorrhage, may sometimes be not so much of advantage, from the virtue of the astringent remedies with which they are moisten'd, as from compression itself; and that, either when the blood issues out of those vessels, which I speak of at present, or from any other which are press'd upon by the tents, or dossils, introduc'd. I remember, not to mention other cases, that a certain poor widow had a hæmorrhage from her nose, which came on after sneezing. It began with violence, and continu'd to flow for nine hours, till at length I, who was then a young man, going by chance where she was, and being entreated by the weeping women around her, I approv'd of the remedies which had been made use of, after bleeding, though externally applied, more than internally, and only made this one alteration, that tents of linen, bolster'd up together very hard, should be applied to the nostrils internally, instead of soft ones; which being done, the blood immediately stopp'd. These were, indeed, moisten'd with the juice of nettles, (by which only, when snuff'd up into the nostrils, I have seen a hæmorrhage, sometimes, restrain'd) and that mix'd together with the white of an egg, and the foot, which is scrap'd from the bottom of a brass kettle, rubb'd into the finest powder. The former tents were, indeed, daub'd over with medicines, that have the power of agglutinating and astringing; but by reason of their softness, were not fit for compression. However this might be, the poor widow lost so much blood from her nose, that sixteen days afterwards, she came to me to ask advice on the score of a new disorder; I mean, a bad habit of body, attended with a palpitation of the heart, and a difficulty of breathing, as generally happens. She at the same time told me, that she had felt a kind of anxiety, when the blood was stopp'd, which had afterwards gone off; and that after some days, the menstrual discharge had come on, but in less quantity than usual, and black; and, what was by no means disagreeable to find, that she made a great quantity of urine. Wherefore, I dismiss'd her, with hopes of recovering her former health, so that she would but observe that method of living which I had persuad'd her to observe, and use some few medicines that I recommended to her, and were easily procur'd: nor were her hopes disappointed.

But to return back to the subject in hand: As the vessels that pour out

the blood, are not always situated in those parts of the nose, which can be compress'd by the introduction of tents; or, which would be still more certain, if the vessels were at any time in a part of the septum, that might be brought into sight, by an instrument, not far unlike that which the celebrated Trew invented for another purpose (*b*); we must endeavour, in extreme cases, to see if we may be happy enough to compress them by that method, which the celebrated Heister mentions (*i*), as taken from Le Dran, of restraining the blood, after the excision of a polypus, now especially, as the very ingenious surgeon Goulard (*k*) has taken great pains to render it more easy, and less inconvenient. But the less room there may be for remedies of this kind, so much the more care must be taken about others: among which, if at any time the extremity of the case compel the physician to try the *desectio animi*, or swooning, he seems to be less commendable, who attempts to bring on a fainting, by causing sudden fear in the patient, than he who attempts it by tying bands round the limbs, and raising the patient up to sit; for in this way, the bands being immediately untied, and the patient again lying down, and having such remedies apply'd as were previously prepar'd for that purpose, he can more easily remove the syncope, than if it had been the consequence of terror. But as to what it may be necessary to give in obstinate hæmorrhages, in order to preserve the strength, we must take care, that they may not be of such a kind, as either to excite the motion of the blood, or suddenly to encrease its quantity. Thus Valsalva gave broths made of rice or barley, and even these sparingly, and in small quantities, at different times: notwithstanding rashness has had sometimes a happy effect, as in that wounded and thirsty youth whom Schneider mentions (*l*), and another young man of whom Lower writes (*m*); the first of whom, in an immoderate hæmorrhage, drank such a quantity of beer, that drops of blood came from him, "chiefly watry;" and the other drank so greedily of broths, that the drops of his blood were more like the broth he had so often drunk, "than blood." Yet you will find, that both of them were sav'd, and that the young man, afterwards, "grew up into "a strong and well built man:" so that you may perceive it to be sometimes much better, where necessity compels you, to give broths in a somewhat larger quantity, in order to preserve the circulation of the remaining blood, as far as it can be done, than to suffer the circulation to languish, and fail, at once, from too great a hæmorrhage, and too great an abstinence, at the same time.

But if you, perhaps, ask me what external remedies Valsalva us'd where compression could not take place, I will readily tell you. He first order'd cold water to be thrown into the nose by a syringe, which he had often seen have more effect thus applied, than he could have expected. But where this did not sufficiently answer his purpose, he then made use of spirit of wine, in the same manner. Yet he could not have read the very experienc'd Schlingius (*n*), who has written, "that alcohol was always applied by him, and

(*b*) *Commerc. Litter.* a. 1741. heb. 16. n. 2.

& tab. 1. fig. 8, 9.

(*i*) *Instit. Chir.* p. 2. f. 2. c. 71. n. 10.

(*k*) *Mem. de l'Acad. R. des Sc. A.* 1740.

(*l*) *De Catarh.* l. 3. c. 3.

(*m*) *Traët. de Corde,* c. 2.

(*n*) *Aët. N. C.* tom. 6. obs. 20.

"another physician, at Amsterdam, by way of specific, with success," and by degrees drawn up the nostrils, inasmuch as it was a remedy, not less efficacious in stopping this hæmorrhage, than in stopping the hæmorrhages of wounds. And I suppose that Vallalva had transferr'd this practice from the bleeding of wounds to that of the nose, having known by experience, how much it contributed to coagulate the blood, but especially to contract the mouths of the smaller arteries; for hence it seems to be, that it is, sometimes, not equal to the task of stopping the hæmorrhage, which succeeds the extraction of a tooth, because then, doubtless, the orifice of the little artery, that is ruptur'd, is not prominent into the cavity of the socket, but is entirely contracted, and lies hid within the substance thereof, in the same manner as that artery within the os tibiæ, from which Petit observ'd a very troublesome hæmorrhage (*o*). You see therefore that cases may happen, sometimes, in which you cannot restrain the flux of blood from the nostrils, even by this remedy. And this you will believe so much the more, of other both internal and external remedies, when you have read, that so many, of both kinds, have been frequently applied by physicians in vain; and in particular by Lentilius (*p*), who prudently declares, that the different causes of hemorrhages, in different cases, are to be consider'd.

Once on a time, when I was turning over some old records of my country and province; I found that in the year 1200, "there was a great mortality of men, in the space of twenty-four hours, in Tuscany, and Roman-diola, by a flux of blood from the nostrils:" and, indeed, in the same year, Clementini, the historian of Rimini, has the following passage, to the same purpose, although he does not say, from what part the blood issu'd (*q*): "Many died at Rimini from a flux of blood, within twenty-four hours, and a still greater number at Ravenna, and in other cities of our province." And do you imagine that physicians did not then apply all the astringents, in particular, and other remedies then in use? Yet you see it was in vain; because the epidemical cause was unknown. And in regard to astringent medicines, attend to the admonitions of Lentilius (*r*), and this besides, whether it is probable, that when they are taken, they can so soon come to the parts where their force is requir'd, and act with so great efficacy there, as we would wish them to act with, and at the same time, not astringe the vessels in other parts. And yet you will now see many flying, when danger is at hand, immediately to the scarlet fungus of Malta, which perhaps they cannot get true. For ever since I was inform'd, by a knight of Malta, who was my fellow-citizen, in how small a number these fungi grew every year, as they were confin'd to one very narrow rock, and with what care they are wont to be preserv'd, that they may be sent, as presents, to princes, and great men; I am much afraid, lest those that are to be sold are brought from another rock, near Trapani, or from Africa, like them in form indeed, and, in some measure, in colour also, but far unequal to them, as this knight of Malta inform'd me, in efficacy.

(*o*) Mem. de l'Acad. R. des Sc. A. 1732.

(*q*) Racconto Ist. della Fond. di Rimini

(*p*) Eph. N. C. Dec. 3. A. 8. Append. n. 1. 3.

10. ad obs. 90.

(*r*) ad cit. obs. 90.

26. The two observations which are produc'd, the last of all, in this section, and both, as is said, made at Rome, are of such a kind, that one which gives the relation of a leech, penetrating from the nostrils to the coats of the brain, is at the same time that it is propos'd, justly, and deservedly, rejected; but the other of a baker, among the lower class of people, at Rome, is related as certain, who "having sneez'd four and twenty times successively, the next time of sneezing, which succeeded, and which "was the twenty-fifth, was fatal to him, by the arteries and membranes, "which surround the brain, being ruptur'd thereby." It is true, that I have no doubt about the dangers which may arise from sneezing, as they are sufficiently prov'd by medical histories: and moreover, if you would have it that the vessels of the brain were ruptur'd in the baker, from this cause, as the vessels of the nose were in the widow of whom I spoke just now (s); I shall not be much against embracing your opinion. But this is doubtful, whether the vessels of the brain and membranes were really ruptur'd in that baker. For Famianus Strada, who is brought by way of a witness to the observation, in that *prolusio*, which is entitl'd *Pistor Suburbanus* (t), has nothing at all of it, as far as I could find, except that it was related to him, "that "after having sneez'd three and twenty times while he held his breath, in "the twenty-fourth effort of sneezing, he breath'd out his last;" but of the internal cause of his death, much less of the inspection of the brain, there is not the least word. And without this inspection, how easy it is to be deceiv'd, the following observation, which was made by two physicians, Salano and Bigatti, will show: these two physicians were eminent men at Bologna, where the observation was taken, about the end of the year 1705, when I was there.

27. A nobleman, about forty years of age, very fat, and given to drinking freely, as was reported, had been troubl'd, for some time, with a difficulty of breathing, after eating, and after going up stairs. This gentleman being accusom'd to sneeze frequently and violently, at length, after sneezing some times together, said, that he was suddenly seiz'd with a great narrowness of the chest, and a difficulty of breathing: and as he said this, he at the same time sneez'd, and died, his mouth being, as some said, distorted. When his belly was open'd, every thing appear'd sound, if you except a great quantity of fat, and especially in the omentum. The cavity of the thorax, for that reason perhaps, seem'd to be a little less than it ought to be (u). The lungs were somewhat livid. There were no polypous concretions in the heart. Finally, there was some water in the ventricles of the brain, but in small quantity; and the vessels thereof were distended and turgid; but whole.

28. That sneezing which is a kind of convulsion, instituted by nature, may, if at any time it exceed its natural bounds, degenerate into a true and preternatural convulsion, you can easily conceive; and that by this means, an apoplexy may be brought on, you have heard already from me, on another occasion (x): but this happens chiefly in those bodies in which, as the

(s) n. 25.
(t) l. 3. Prolus. 4.

(u) Vid. Epist. 27. n. 2.
(x) Epist. 21. n. 17.

blood from their manner of life is redundant, it nevertheless cannot, by reason of the resistance it meets with from fat in other parts, distend any vessels more than those which are contain'd in the cranium.

But by what means the membrane of the nose, when irritated, can draw the diaphragm into consent with it, and excite it to the motion of a violent sternutation, I see that many very excellent men so much wonder, that from this well-known sympathy betwixt the nostrils and the diaphragm, they take an argument against those who account for the consent of parts, one with another, from the correspondence of the nerves. For there is no commerce, they say, between the olfactory nerves, which belong to the first pair of the brain, and the nerves of the diaphragm, which come from the cervical; forgetting truly the nerves which are sent from the fifth pair of the brain to the membrane of the nostrils; or rather taking no heed, that the same fifth pair belong to the intercostals, which have so many communications with the cervical, and pass through the diaphragm. And they even belong to the intercostals, if not by those two filaments, which were suppos'd by most anatomists before, and which had given occasion to a long controversy, yet at least by a little branch, which Meckel (y), that most diligent investigator of the nerves, trac'd a little lower, from the fifth pair, quite to the intercostals, on each side; so that we are now not only at liberty to explain the consent between the nostrils, and the septum transversum, from this communication, but even between the nostrils, and the viscera of the belly, as that which I observ'd in a noble lord, for whom I was consulted in former years. For the attacks to which he was subject, and which were of the epileptic kind, beginning from the hypochondria, were preceded by the sense of a kind of foetid smell, that was very troublesome to himself, though none of the by-standers could ever perceive any thing of it, not even in the breath of his mouth and nostrils, where he chiefly complain'd of this fætor, though they purposely receiv'd his breath at the time of his perceiving it; so that for this reason it seem'd to me, that from this branch of the intercostal nerves being irritated in the hypochondria, a motion was propagated into the membrane of the nose, not unlike what would have been excited by effluvia, issuing from a foetid substance; till at length the irritation of the intercostal nerves increasing, a much more disturb'd and irregular motion seiz'd upon the brain, and the nerves in general. But enough on the diseases of the nose.

29. Three sections follow upon the diseases of the mouth, the voice, and the fauces. To which, if I say, that you cannot much expect Valsalva's observations, or mine, to be added; you will perhaps wonder. Yet you will cease to wonder, when you shall observe, that it is not my custom to repeat histories, or to produce those in one place, which may be produc'd with much greater propriety in another. Wherefore you will read better in other letters, those which, in some measure, might be referr'd hither. In the mean while, you will have some animadversions upon these sections, which may either tend to vindicate to you this resolution of mine, or shew something which has been observ'd by me. And as all these things may be compre-

(y) Hist. de l'Acad. R. des Sc. de Berlin A. 1751. Class. de Philos. Experim.

hended here, without a great compass of words; I did not think it necessary to write of them separately; but rather judg'd it proper to join them to this letter.

30. The twenty-first section, indeed, gives you more than five and thirty observations. But besides that the second observation is a part of the ninth; and the eleventh a part of the fifth; and the sixth, which is indeed very wonderful that it should pass unobserv'd, nothing but a compendium of that which immediately follows, the seventh; if you read over the whole section, you will scarcely find a history which does not relate to some other more violent disease, and is not repeated amongst others under the head of such disease.

And the same you will observe, even in the twenty-second section. Add to this, in order to finish what I have to say upon the twenty-first section; that the thirty-first observation, and others which are propos'd in the double appendix, are not observations made on those who died of the disease, but rather conjectures, and in part less laudable than we would wish. But what shall I say of some other observations? In the thirteenth, the patient is said "to have spit out his very brain from his mouth;" for although any person, who has read that history in Fernelius, which is but carelessly related in the scholium, will not deny, but that it might in some measure happen; yet he cannot easily believe it, unless the basis of the cranium be describ'd in the observation, to be perforated from a caries; so that it is very certain the corrupted part of the substance of the brain itself, had really pass'd from thence into the fauces.

The twenty-ninth and thirtieth observations have arguments prefix'd to them, affirming that which is not probable. For who can suppose, that a pain of the teeth, which had formerly preceded, and is mention'd in the second observation, was "from yellow serum contain'd about the corpus fal-ciforme," of a lethargic person, and even "from yellow serum contain'd within the left ventricle" of the brain. Or who can believe, that the pain of the teeth, and caries, which are treated of in the first, were "from a humour distilling from the head, by a peculiar passage, into" *the antrum of Highmore?* For that was the blunder of Highmore himself, that the foramen of the antrum, which he saw, and delineated in the figure that is added (z), he did not consider as the emissary of this antrum, as it really is, but as the immisary foramen. Finally, not to take up your time, that which is propos'd in the argument of the thirty-second observation, "from a tooth that was a little prominent being cut off, convulsions and death," is not altogether contrary to probability; but it is at least doubtful, whether what Caspar Bartholin has written in that observation (a), *statim convulsa & epileptica decidit*, signifies death, or only an epileptic paroxysm.

31. Enough of animadversions you say, expecting, perhaps, the observations which I have made on those pains of the teeth, in particular, with which you are so often troubl'd. But I have scarcely any thing to add to what I have hinted before, on this subject (b). As far as I have been able

(z) Corp. hum. Disqu. Anat. Tab. 16. Fig. 3. ad litt. d. (a) Instr. Anat. libell. 4. c. 12. (b) Epist. Anat. 13. n. 6. 7.

to observe, quite different remedies are useful to different persons; and even different things, at different times, to the same person, in proportion, doubtless, to the various causes, and dispositions of circumstances. For, in myself, I have sometimes found warm milk of service; to me, at other times of no service at all, and spirit of wine saturated with camphor more useful, and sometimes, again, neither one nor the other has been of advantage. And although I am afraid of an acid, I had, nevertheless, determin'd to try that among other things; of which Jo. Stephanus testifies, "that he had often made the experiment (c)," affirming at the same time, "that the tooth-ach was eas'd miraculously, as it were, if the mouth were wash'd with the acid of a decoction of tartar." But it was much better to have had no occasion for experiments of this kind, since it is now a long time that it has pleas'd God to indulge me with a freedom from these tortures. For other persons, as well as Stephanus, you know, had promis'd the same things, by applying a little bone from the foot of a toad. Yet I know a very learn'd physician, who made the experiment in vain, having extracted all the bones, both of a living and dead toad, lest, perhaps, on account of the difference of authors, in defining any certain little bone, he should take one for the other, and applied them separately to his own teeth and gums. Perhaps some person will say, that these bones were not taken away at a proper time of the year: or not rubb'd so hard upon the gum as was necessary. I should rather believe the last, as I have myself sometimes gain'd a little ease and advantage from the friction of my gums; yet not from applying a bone of that kind, but from my fingers only: for which reason it is natural to believe, that those miracles are to be set down to the account of friction only, when there is room for it to take place, rather than to any peculiar virtue, or property, of the toad. I remember, also, that a man, otherwise not unlearn'd, boasted of performing the same kind of miracle, if into that nostril, which answer'd to the tooth, a fluid was drawn up, distill'd from spirit of wine, in which a warm and bitter herb, that was known to him, (with the powder whereof he had driven away fevers, and which grew equally in mountainous and in plain places) had been macerated: and yet he asserted, that the snuffing up of this liquor was not follow'd by a very great irritation of the nostrils. I, however, with-held my assent, not so much because he said the name of the herb was unknown to him, but rather because he asserted, without any hesitation, that this remedy of his was equally efficacious and instantaneous, whatsoever should be the cause of the pain.

32. But in regard to privation of taste, by reason of the vitiated situation of the nerves, I never read that in Columbus, which the thirty-fifth observation, in the twenty-first section, exhibits; but I immediately remark'd, that, if no mistake had crept in at the time of the observation, all future disquisition was superfluous, in order to determine the controversy, whether the fifth, or the ninth pair of nerves, for both of them are subservient to the tongue, be that which gives the faculty of tasting thereto, since in a man who was depriv'd of this faculty, it was the fifth pair which did not go to the tongue. But I cannot help being vex'd, that Rolsinc, when he had

(c) Comment. in Hippocr. de hom. struct.

made an observation similar to this, in respect to the nerves at least, as you see in the same section, upon another man, said so little upon a subject of such moment, that he did not give the least hint, whether the taylor, on whom his observation was made, had been without the faculty of tasting, or not. And I had a much greater desire to know this, than whether he devour'd living animals also, glass, stones, and other things, as the man, from whom Columbus took his observation, had done. For, as others, who were not deficient in the sense of tasting, have devour'd things, not altogether unlike these, or even still more injurious, as for instance, the swallow-knife of Basil, a slight description of whose belly, as considerably hurt thereby, you have in Felix Platerus (*d*), which Columbus has omitted to take notice of, in his subject; and as other branches of nerves are subservient to swallowing, and preparing the ingesta, as you very well know; Columbus has by no means satisfied those, who wonder at so great a voracity in the man, by proposing this one cause only, that he wanted the faculty of tasting.

But do not let it surprise you, that I should say it was the fifth pair of nerves, which Columbus and Rolsinc call'd the fourth; as anatomists were long accusom'd to do. For if you look into each author, where they describe the fourth (*e*), and compare them with Willis (*f*); you will plainly see, not only that I say the truth, but that some considerable errors have crept into that very short annotation, which is subjoin'd to this observation in the Sepulchretum, as if they had pointed out that which "is the sixth pair of Willis," and he had taught that the sixth pair "went to the palate."

33. But now something must likewise be observ'd on the twenty-second section also, which relates to disorders of the voice. The first observation sets forth a loss of speech, in a woman, after a long hoarseness, in which our Spigelius found "the whole aspera arteria inflam'd on its internal part, together with a remarkable blackness." Although an inflammation, already degenerating into a gangrene, occupied this whole tube internally, yet it is sufficient, in order to understand the aphonia, and preceding hoarseness, to consider the larynx, which is the upper part, and, as far as it relates to the voice, the principal part of the whole tube: nay, it is even sufficient to examine the glottis only, which is the principal part of the larynx. For if this alone be made rough, as in the aperture of a flute, a hoarseness is immediately the consequence, as Schelhammer (*g*) has observ'd: who also explains the prognostic of Gordonius, "That a hoarseness of the voice, which has lasted for a year, does not admit of a cure;" and this also, "If it goes on any longer, it makes the voice small, and at length entirely takes it away;" which happen'd to the woman on whom Spigelius made the observation. But it is by no means necessary for us to follow all the opinions and explications of Schelhammer on these things. However, we except some of them besides, especially that which Dodart (*h*) very much approv'd, that the voice was then generated, when the air struck against the glottis; but

(*d*) Mantiss. obs. 50.

(*e*) De Re Anat. l. 8. c. 3. Dissert. Anat.

l. 4. c. 35.

(*f*) Cerebr. Anat. c. 22.

(*g*) Dissert. de Voce, p. 2. c. 3.

(*h*) Mem. de l'Acad. R. des Sc. a. 1700.

that it was increas'd and modified, by the other resounding parts, against which the same air is stricken presently, before it goes out from the mouth of the person who speaks. For as to what has been advanc'd by some learned men against Dodart, "That the diseases of the nostrils not only destroy the speech entirely, but the voice ;--and that when the palate has been eroded, the voice was not only injur'd, but entirely destroy'd, as you read in Forestus, book the thirty-second, observation the twenty-second ; and that the same person recover'd his voice, by having a plate of metal fix'd in the place of the bone ; and that the same event had been observ'd by Hildanus, century the second, observation the twenty-second ;" I myself, indeed, (and I would have you believe, that I say these things more for the sake of truth, than for the sake of Dodart, or myself) I myself, I say, have observ'd an half-form'd, or inarticulate voice, and one that had its force diminish'd in such cases, but never destroy'd ; unless, perhaps, the same cause which had injur'd the palate and the nostrils, had injur'd the glottis also, or those parts which are necessarily requir'd to the utilities and purposes of the glottis. Nor is the testimony of Hildanus against us, in this matter ; who says, that when the silver plate was taken away from the hole in the palate, which was "very large, scarcely could more than a word or two be utter'd distinctly and articulately ;" for this relates to the speech, and not to the voice ; as the observation of Forestus does also, who says, that without a like instrument to the former, the patient "could scarcely be understood when he spoke ;" but when this was replac'd, "that he spoke with ease." Yet if the case which Forestus has subjoin'd, from the fifth century of Amatus, case the fourteenth, when cursorily read over, seems to relate, not only to the speech, but to the voice itself ; which was at one time "altogether deficient," and at another time "was recover'd ;" yet if you compare it closely with the observations of Forestus, and Hildanus, in particular, you will then perceive, that it refers to the strength of the voice, and the speech ; since it is not probable, that the foramen, which was shut up with an instrument, made like a nail, should be larger than that which Hildanus call'd "very large ;" nor, if it was less, that it should be of more detriment to the voice than a very large one.

But whether the too great fullness of moisture, which by distending the fibres of the glottis very unequally, had first only exasperated, or made them rough, but at length, by its long-continu'd afflux, so relaxes them, that they lose, finally, all their elastic force ; or, on the other hand, an internal dryness crimps up, and exasperates the fibres, and at the same time makes them shrink, subside, and be less tense, and consequently less obedient to the motions of the muscles ; the case may at length come to this point sometimes, that the hoarseness degenerates into a loss of voice : which seems to have happen'd to that noble orator, Q. Hortensius, if we give credit to Salmoticus (i), when he writes thus :

*Vel rabidus clamor fracto cum forte sonora
Planum radit iter, sic est Hortensius olim*

(i) De Medic. c. Uvæ, faucib. & c. medend.

Absumptus :

*Assumptus : causis etenim confectus agendis
Obtineat, cum vox domino vivente periret,
Et nondum extincti moreretur lingua deserti.*

And in order to convince you, that Samonicus had hinted a foregoing hoarseness, call to mind what Lucretius (*k*), whom Samonicus often had in his eye, as I have formerly shewn (*l*), had written on this subject :

*Præterradit enim vox fauces sepe, facique
Asperiora foras gradiens arteria clamor :
Quippe per angustum turba majore coorta
Ire foras ubi cæperunt primordia vocum,
Scilicet expletis quoque janua raditur oris
Rauca viis ; & iter lædit, qua vox it in auras.*

But of the case of Hortensius, perhaps, more on another occasion (*m*). Now let it suffice to have said thus far on the subject of hoarseness, and the loss of speech, which sometimes succeeds it.

34. But as to the aphonia, when the term is us'd $\alpha\phi\omicron\chi\eta$, or by way of eminence, and signifies a disorder succeeding to an injury of the brain, let me add a few things, relative thereto, to the first appendix, which you will see after the eighteenth observation (*n*). You will read in this appendix, that it is an affection of a middle nature, betwixt an apoplexy and an epilepsy, because the patient is without sense, and without voice, yet not without motion, nor attended with convulsive agitations ; that it may sometimes degenerate into an apoplexy, according to the vehemence of the cause ; and that to this the aphonia, also, may be referr'd, of which the aphorism of Hippocrates speaks (*o*) : “ If any person, who is drunk, suddenly become $\alpha\phi\omicron\chi\eta$, or speechless, he dies convuls'd, unless he is seiz'd with a fever, or recover his voice, at the time of his drunkenness going off ; that it arises, generally, from a consent of the lower parts, and a narcotic vapour, suffocating, or disturbing the animal spirits in the brain.” But that this word “ generally ” was not inserted with less propriety here, than it was in the translation of the same aphorism by Celsus, my observation, which shall be immediately subjoin'd, will shew you. The translation of Celsus runs thus (*p*) : “ Whoever has lost his speech from drunkenness is, generally, carried off by convulsions, unless either a fever has come on, or he has begun to speak, at the time in which the drunkenness ought to go off.”

35. A husbandman, of a middle age, but of a lean habit of body, and having his skin universally brown, was seiz'd with an aphonia, when he was drunk. He was brought into this hospital, scarcely being able to move his head : and there, within the fourth day after his drunkenness, his pulse being very slender and fault'ring, but without being convuls'd, he yielded to his fate.

His body I carefully dissected at the college, not only to finish the anatomical demonstrations, before the end of February, in the year 1737, but

(*k*) De Rer. Nat. l. 4. v. 531. & seqq.

(*l*) Epist. in Samonic. l.

(*m*) Epist. in eund. ll.

(*n*) Sect. 22.

(*o*) 5 sect. 5.

(*p*) De Medic. l. 2. c. 6.

also that I might discover, by examining almost all the parts, what appearances there were which would serve to throw light upon the disease. In doing this, I observ'd the following preternatural circumstances. On the internal surface of the stomach, at the fundus, some black points occur'd, like the larger granules of tobacco: which, after examining a little more attentively, I perceiv'd, were small, indeed, but certain, marks of a mortification; after that I observ'd, a little higher, two black spots, and another, near these, that was red, and something bigger, and which was in effect a true, though a very slight, ulceration. But I wonder'd what was the cause, that I found diseas'd appearances like these, and even greater than these, in the stomach, œsophagus, and duodenum, of a poor woman, with the dissection of whose body I had begun the anatomy of this year, as her method of living, and the sickness of which she had died, were quite of a different nature, as I shall tell you on a more proper occasion (*q*).

However, I found the gula and intestines of this man, whom I then dissected, to be entirely without injury; except that in the first part of the ileum internally, one or two small prominences appear'd, like the point of a little finger, and of a reddish substance, as I perceiv'd by dissection, but not glandular: a small portion of the cœcum was red, and a still larger of the rectum. The spleen was rather thicker than it ought to be naturally, the liver somewhat hard, and of a palish colour; and in the gall-bladder was a somewhat viscid bile, which was of a dirty green. The urinary bladder was half-full, and had pretty thickish coats. In the bottom of the abdominal pelvis was as much water as a glass of a moderate size would contain; and this water was bloody, but whether from the dissection or not, is perhaps doubtful.

In each of the thoracic cavities was as much water of the same kind. The heart, externally, had but little fat, and in the ventricles were polypous concretions. The valves which are plac'd at both the venous orifices of the heart, were here and there pretty much thicken'd, and at the same time were found to be hard and whitish. In like manner, the aorta, from the heart quite to that part where it begins to adhere to the vertebræ, shew'd, internally, some white spots, lying at a distance from each other, that were the first marks of a future ossification.

The upper part of the cranium, which was pretty thick, and the dura mater, in whose sinusses something of a polypous concretion was observ'd, being remov'd from the subject'd pia mater, the vessels, in this membrane, appear'd to be distended with blood, but not greatly; and under the same, about the sulci of the cerebrum, was a limpid water, and in it were contain'd many bubbles of air; notwithstanding it was at the time of the year I mention'd to you, and scarcely the sixth day after death. In the lateral ventricles also was a pretty large quantity of limpid water, and the choroid plexusses were pale. And while I rais'd them up gently, and backwards, I perceiv'd that part of the pineal gland, which was connected to them, to be cover'd with a yellow substance, which indeed seem'd soft in itself; but if you rubb'd it between your fingers, it was evidently of a sandy kind of substance. The brain was firm under the knife, but all the medullary substance that was beneath the fornix, and the nerves themselves, were extremely lax.

36. You see therefore, to omit here, those things which are consider'd in other places; that neither by consent alone, nor from vapour, the spirits and the brain were here affected; nor did this man die convuls'd, notwithstanding he had been seiz'd with an aphonia, when he was drunk; and his voice had not return'd at the time when his drunkenness should have gone off.

But what time shall we say this was? I know that in the books of Hippocrates, sometimes one time, and sometimes another, is pointed out: yet I also know, that in the second book *De Morbis*, which generally goes along with them, it is said (r), "If any one is depriv'd of his voice from drunkenness,---and a fever does not immediately attack him, he dies on the third day;" so that it would seem to follow, that the drunkenness should go off, at least, in three days. Yet it is natural to believe Heurnius (s), when he reminds us, "that Galen indeed says, drunkenness goes off on the second or third day, for the Greeks us'd a heavy wine; but that, in other places, drunkenness continu'd only six or seven hours; nevertheless, regard was to be had to the power producing the effect, and the body on which the effect was produc'd:" that is, as he had just before said, "that drunkenness would be sooner or later carried off, according to the strength or quality of the wine, the peculiar nature of the patient, the time, and the place of the debauch." You will find the celebrated Raymannus (t) perfectly agreeing with Heurnius, as that author relates the manner in which he had sav'd a patient that had an aphonia from drunkenness, and was already at times agitated with convulsions. On the other hand, Littre (u) dissected a woman, who died, within twelve hours, of drunkenness, not without a slight fever, and convulsions: and as he has taken notice of the deprav'd constitution of most other parts, even in so short a time, so it were to be wish'd, that he either could, or would, have made known, what was the condition of the brain at that time (x).

37. But now I have a mind to give you some account of a case of a far less violent, and very short aphonia, which, when I was a young man, and resided in my native place, I had the care of, together with two older physicians, with whom that nobleman, count Alexander Monfignani, would have me associated, in the treatment of the disorder. He, being more than sixty years of age, slender, bilious, and us'd to speak with a deep voice, as the phrase is, and having been before subject to strangury, gout, and hæmorrhoidal fluxes, and then being entirely free from all these, and even having been seiz'd with no rheum in the last winter, which had us'd to affect his fauces, frequently, in the winter-time, attended with much spitting; began a little before the beginning of May, without any previous manifest cause, to be seiz'd with an interception of voice, and partly of respiration also; so that there was a sense of constriction about the larynx, and no where else. This disorder suddenly came on, and suddenly went off, without any excretion whatever. The time of its attack, and the time of its continuance,

(r) N. 22.

(s) In cit. Aphor. n. 5.

(t) Act. N. C. tom. 6. obs. 1.

(u) Hist. de l'Acad. R. des Sc. a. 1706.

Obs. Anat. 5.

(x) De hoc Aphoniæ genere vid. epist. 63.

n. 13, 14.

were various : for its continuance, at most, did not exceed the space of two minutes ; and was very often still shorter. And although almost every night, about the seventh hour, this disorder came on ; yet it sometimes came on, likewise, in the day-time, from gaping, sneezing, or coughing, not always indeed, but perpetually by the action of drinking, if wine only was drunk ; but not if water, oil of almonds, whey, emulsions, or other liquors, recommended by us, were taken down. And, indeed, he had been us'd to suffer something of the same kind before also, when he, who was a sober man, us'd wine at his table, as the custom is, although it was a much shorter and slighter inconvenience. But now the disorder was as I have describ'd it ; nor could the patient, when he was seiz'd therewith, take any thing in his mouth, nor stand in one place, but was compell'd to walk. However, his head, his thorax, and abdomen, in like manner, and his neck, if you felt them with your hand, as the pulse also, were very natural and well. The tonsils only, and their neighbourhood, appear'd, in a manner, half-inflam'd ; and there was a great quantity of discharge by spitting, the taste of which was manifestly acid to the perception of the patient : and the more easy expectoration of this matter, occasion'd by sucking barley-sugar, as it is commonly call'd, seem'd sometimes to prevent the invasion of the disorder. It was most probable, that the membrane, with which the upper part of the larynx, and the parts bordering thereon, are cover'd, being endow'd with so much a more exquisite sense, from being affected with a kind of phlogosis, when it was a little more sharply than usual irritated by the acid particles, either of the wine, or of the moisture, from gaping, sneezing, coughing, or even sometimes by the quantity itself, which was press'd out plentifully from the glands that lay about those parts, and which was greatly vitiated by stagnation in them ; it is probable, that this membrane, I say, was by these means contracted, and crisp'd up, and drew the nerves and muscles into consent, so that they constring'd the larynx much more streightly than common ; and that so much the more easily, as they were by nature already something prone thereto ; and perhaps even still more prone from the hypochondriac affection, which the flux of blood, by the hæmorrhoids, had indicated. And this supposition was confirm'd by the event. For having gently cleans'd the primæ viæ, and taken away blood sparingly, first from the arm, and then from the fundament, whence it us'd to be discharg'd by nature, formerly, as I said before, and at the same time giving such medicines internally, as might soften, relax, dilute, and in the mean while correct, the acid flavour, he was entirely free from the attack of his aphonia many nights together, and it came upon him much more seldom than usual in the day-time : so that we recommended to him the taking of a short journey, after which his spittings were much diminish'd in quantity, and became less acid, and he could bear wine diluted with water ; and, not to use many words, within the fortieth or fiftieth day, from the time he had begun the regimen, without any fear of a more violent or longer disorder, or at least without any fear of this disorder returning, the affection was quite overcome, and remov'd. Give me leave just to add here, and, at the same time, leave you to judge as you may think proper, of what this very patient, who was a grave man, asserted he had formerly seen in a nobleman at Rome, who was seiz'd with a similar disorder ;

disorder; to wit, that his disorder was accusom'd to be remov'd, if any body breath'd into his ear. But it must, at least, have been a very different affection; nor would our patient have sent for three physicians to attend him, if he could have been cur'd by so easy a remedy.

38. I must also add something upon stammering. For in the twenty-first observation our Sanctorius is quoted as saying these things (y): "That there are, in the middle region of the palate, that is, in the fourth bone of the upper jaw, in all whom he had seen to that time, who could not express the letter R, two foramina, which are by no means found open and obvious in those who are under the influence of this disease; therefore, that the immediate cause, which supposes others granted, will be those two passages being open." Nay, truly, not being open, any one would say, who should read this passage with any tolerable care, and at the same time attend to the argument prefix'd to the observation, which is this, "That stammering depends, sometimes, on the defect of the foramina of the fourth bone of the upper jaw." But if he should examine the passage, in Sanctorius himself, he would find that he has written the very contrary to these things: for he says, that he had seen, in persons who stammer'd, those two foramina, "which are by no means found so open and obvious in those who are free from this disorder; wherefore, the immediate cause, which supposes others granted, will be," says he, "these two meatus, or foramina, more open than they ought to be." See, I beseech you, with what carelessness the words of authors are sometimes copied: yet this is the passage of the Sepulchretum, with a view to which very excellent men have written, "That Sanctorius had attributed stammering to the defect of the ductus incisivus, in the Sepulchretum of Bonetus, l. p. 473." But if they had chosen rather to look into the chapter of Sanctorius, which is quoted in the same place (z), without doubt, they would neither have believ'd that, nor would have understood the ductus incisivus. For Sanctorius, a little below, adds these words: "As I said that in the middle region of the palate, two foramina were observ'd, which are the causes of stammering, so, in like manner, I observe larger foramina, near the teeth, (yet in all these persons, congenial with their original formation) through which a pituita distilling and moistening the tongue, on its anterior part, makes an impediment in the speech, from whence they become lisping and short-tongu'd;" so evident is it, that from the meatus being very open behind the dentes incisores, he had accounted for the habit of lisping only, and not that of stammering, of which the question is in this observation: and how these two kinds of impediment to the speech differ one from another, the learned scholia to the next and twenty-fourth observation, will shew.

You will ask here, why this second observation of Sanctorius is omitted in the Sepulchretum, whereas the first is given there, though erroneously? And in like manner, what can these two foramina be then, in that same fourth bone, and in the middle region of the palate, which are more open in persons who stammer than in others? And at length, how much regard

(y) Sect. 22.

(z) Meth. vitand. error. l. 3. c. 9.

is to be paid to these observations of Sanctorius? I do not doubt but it was owing to the same carelessness which perverted the first, that the second was omitted.

And as to the foramina in that middle region of the palate, I do not remember to have seen any thing of them in the many dry and prepar'd heads that I have examin'd; nor do I at this present time see any such thing in any of these heads which I have before me now, while I write; nor yet should I easily believe, that in so great a number of heads, as have come into my hands, I never happen'd to light on one that had belong'd to a stammerer, in which, doubtless, I should have seen these foramina very plainly, inasmuch as they were very open, and obvious in them, though in others very obscure.

But although it is natural to suspect, that what Sanctorius had by chance observ'd, in some stammerers, he had transferr'd to all; and although difficulties are not wanting to prevent our assenting thereto, from reading his words, and even from the very things that he says, in confirmation of what he advances; for he confesses, that even they in whom the mouth naturally and constantly overflows with pituita, are not, for that reason, stammerers, nor lispers; yet on account of his well-known excellence in other matters, it will be more just and fair, I think, not to pronounce any thing absolutely on the point, before the question shall have been accurately canvass'd by skilful anatomists, who have examin'd the heads of many stammerers and lispers to this purpose.

So the celebrated Delius (*a*), having found a double uvula in a certain person, who had been a stammerer, very prudently admonish'd anatomists, that they should enquire, whether other persons who stammer have any fault or disorder about the uvula, or tonsils. And if this were done, I conjecture, being induc'd thereto by very probable arguments, it would be found, that even in him who was a stammerer, the impediment could not, justly, have been imputed to the double uvula. For there are many examples extant of this duplication, which you know I have pointed out, on a former occasion (*b*); nor Zerbus; nor those whom Slevogtius commends; nor I myself, at least in that person whom I dissected at Bologna, have heard any thing of an impediment of this kind, in the speech, notwithstanding almost all of us enquir'd diligently what inconveniences had attended this duplication of the uvula: and without doubt that Lucretia of Zerbus, if she had pronounc'd vitiously in this way, would never have given herself up to the art of singing, nor would have "delighted very much," in the practice, as he himself testifies that she did.

But it is a very supposable case, that stammering may sometimes arise from considerable defects about the os hyoides: and indeed I find the very learned Hahnus has advanc'd this doctrine (*c*); that from the figure of this bone being deprav'd, "persons become stammerers, lispers, and dumb." Nor indeed does it seem possible, that the directions of the muscles which move the tongue can be chang'd, without making the motions of the tongue,

(*a*) Aët. N. C. Tom. 8. obs. 106.

(*b*) Epist. Anat. 10. n. 21.

(*c*) Commenc. Litter. A. 1736. Hebd. 31.

n. 1. ad § 25.

in some measure, deviate from the law of nature. And if Kerckringius (*d*) had written what was true, concerning the os hyoides, when he says, "that in foetusses, not so much as a cartilage of it appears;" I should not have doubted, but it was for this reason, that little children begin to speak very late after their birth; and when they have begun, "attempt only half-words," or "speak their words stammeringly," as Minucius Felix (*e*), and Albius Tibullus (*f*), have said, in order to express their manner of speaking. But the illustrious Albinus (*g*) sufficiently shews, how late this bone, which is the fulcrum of the tongue, and some of its muscles, becomes perfectly compleat on all sides, and entirely bony.

And to our Molinetti it seem'd (*h*), "that the infant did not speak immediately after it was born," for this reason, because the styloform process, from which the styloglossus, and stylohyoideus muscles, take their origin, "does not appear in a foetus." Which if you understand, so as to believe, that he denied the existence of this process in a foetus; he certainly has blunder'd, as Casselbohmius testifies (*i*), that he had seen it in a foetus of four months, and Kerckringius (*k*) even in a foetus of three months. But if you so understand it, that by reason of the slenderness and flexibility of the cartilage, he did not consider it of any greater advantage in its present condition, particularly in order to fix steadily, the origin and action of the muscles, than if there had been none at all; you may by this means sufficiently protect his assertion, from what I saw, when I read over this letter again, would be objected to his opinion, taken from a very singular observation of that most excellent author Haller (*l*). For he, in a man who was about fifty years of age, and who had never labour'd under the least impediment in his speech, found the styloform process of the length of an inch and half, being bony in the lower half of it, and in the upper part of it cartilaginous. But you, to omit this supposition, that in the man whom Haller observ'd, the muscles we speak of might possibly have their origin, in part, from the neighbouring temple bone, as both Valsalva (*m*) and I (*n*) have sometimes found its fellow, the stylopharyngæus, taking its origin; you certainly understand, that the cartilage, which according to the increase of years, was so much thicker and stronger, ought not to be compar'd with that which Molinetti, in consequence of its being so slender and soft, consider'd as none at all, in new-born infants: and you know, at the same time, to what, and to how many muscles, some of the cartilages of the larynx give origin. But in regard to this defence of Molinetti, you yourself will determine.

I indeed think, that from what causes soever the stammering of little children is to be accounted for, it may be imputed to many more causes, than those which are made mention of; and I believe that from the same causes, the stammering of adults arises, as often as ever it happens, that the increasing age cannot overcome one, or more, of these causes. And it will certainly

(*d*) Osteogen. c. 11.

(*e*) in Octavio.

(*f*) l. 2. Eleg. 5. v. 94.

(*g*) Icon. Off. Foet. ad Fig. 152.

(*h*) Dissert. Anat. Pathol. l. 2. c. 1.

(*i*) De Aure Hum. tr. 1. § 43.

(*k*) Osteogen. c. 5.

(*l*) in Dissert. Willigii inscript. obs. Botan. &c. § 2.

(*m*) Vid. Epist. Anat. 11. n. 4.

(*n*) Ibid. n. 8.

be of advantage to enquire into these causes, in young children, since, from the universal stammering among them, it will be more easy to observe the causes of it, so that we may endeavour to distinguish them more sagaciously, in adults, and, as far as it can be done, sometimes, to diminish, or remove them.

39. Lastly, as to what relates to the twenty-third section, which is on the angina, it is very surprising, that no observation is produc'd in this whole section, of that most violent and frequent disorder of the larynx, and the neighbouring fauces, from which it may appear, what has been found in those who have died of a true angina. For some of those observations that are produc'd relate to the lungs, or to these, and the gland thymus, being stuff'd up with blood; the first of which, by their weight, drew the *aspera arteria* downwards, and the latter, by its increas'd bulk, compress'd it; others relate to the disorders of the brain, or of other parts; so that any person, who was unexperienc'd, might suspect, whether this disorder ever belongs to the larynx and fauces. But certainly in the angina, an external tumour often about the fauces, or an internal tumour, as I have more than once seen, and have order'd to be cautiously incis'd, as it already contain'd pus, and in the larynx also, that which was the first cause of performing the operation of laryngotomy, as it is call'd, are sufficient proofs of an angina existing, from an inflammation, which occupies those parts above mention'd; and indeed, to pass over the muscles, by which the arytenoid cartilages are brought close to each other, unless you can suppose, that the glands, which moisten the larynx, are entirely free from those disorders, which happen to other glands of the same kind; it will plainly appear that it cannot be otherwise, but that inflammations, sometimes, and those of the most dangerous kind, seize upon our arytenoid glands, for instance, by the swelling of which the air-passageway, that is there naturally narrow, must be shut up, or of course much obstructed.

However, I do not say this, because I believe that you think otherwise; but for this reason only, that you may understand this to be one of those disorders, the seats of which are peculiar, and sometimes more, sometimes less, dangerous in their nature and effects; and though every one of these circumstances ought to be enquir'd into with earnestness, and care, yet that they do not seem to be enquir'd into by dissection, so much as the seats, causes, nature, and effects of other disorders are (*o*). And this has not been done by me for this reason, because I once had not time to dissect a person who died of the true angina; and ever since that, I have not had it in my power, for want of subjects who died of the disorder (*p*): but with the spurious, perhaps, who certainly, however, did not die from this cause, I dissected one or two. What I observ'd in the fauces and larynx of these patients, you will read over again in the fourth letter I sent you (*q*); and you may, in some measure, refer to the true angina, those things of which I made mention when I wrote on the hydrophobia (*r*). Farewell.

(*o*) Vid. tamen Epist. 63. n. 16. & seq.

(*p*) Sed vid. Epist. 44. n. 3.

(*q*) n. 24. & seqq.

(*r*) Epist. 8. n. 19. & seqq.

THE
SEATS and CAUSES
OF
DISEASES

INVESTIGATED BY ANATOMY.

BOOK the SECOND.

OF DISEASES of the THORAX.

LETTER the FIFTEENTH

Is written upon the Disorders of Respiration, particularly from Causes plac'd on the Outside of the Chest; and also from such as are situated within the Lungs, but especially from Calculi.

I. **A**LTHOUGH the parts in the thorax are much fewer in number than the parts of the head, nor is there any of these parts, whose structure and offices are so involv'd in darkness and obscurity, as those of the brain are; yet among these few parts, there is so great a conjunction, either by reason of their vicinity, or connexions, or offices, that if one is injur'd or affected, the others also are injur'd or affected by consent. And this circumstance would create a difficulty to me, and that frequently insuperable, not only in separating the principal disease from the others that are join'd with it, but also in determining the first and chief seat of such disease, if I were not writing to you, who will require nothing more of me, on this subject, than probable conjectures, as you have generally done on other occasions. This will appear most evident of all, in the case of injur'd respiration, upon which subject the first section of the second book of the *Sepulchretum Anatomicum* turns. For besides that the disease producing this, may exist in the lungs, and at the same time in another part of the chest, it sometimes happens, that it may exist in the lungs, and, at the same time, in another part, on the outside of the chest, as in the head, the neck, and the belly. And, indeed, Boerhaave went so far as to say (a), “that scarcely any particle remain'd in the body, which was not more or less concern'd in the business of respiration;” and he subjoins with great justice, “that the great number of the organs, which concur to the performance of this action, any one of which being injur'd, disturbs the whole function, creates the highest difficulty in diseases, as in the mean while, it is very difficult to know, which, out of the whole number, is primarily, and particularly injur'd.”

(a) *Prælect. ad Instit. § 601.*

2. Nor could any other cause, I suppose, induce Bonetus expressly to insert, up and down in this section, not only so great a number of observations, which belong, in like manner, to other sections; but even the same over again and again, except that each of them did not comprehend the disorder of one part; although he repeated so many, that if you compare them one with another, he seems to have done it much more frequently from carelessness than from design: for compare the sixteenth observation, and the hundred and fourth; the appendix to observation the seventy-eighth, and article the second of observation seventy-seven (and lest you should doubt, whether these be, in fact, one and the same observation, turn to section the seventh of this second book, observation ninety-one); the seventy-seventh, article the last, and the hundred and fifteenth; the eighty-ninth, article the twelfth, and hundred and twelfth; the hundred and fortieth, article thirteen, and the hundred and forty-fifth, article three. But these are at a distance from each other; so that the author's memory might much more easily fail him, and especially in so great a number. But you may also see the repetition of those that are very near to each other. Compare, therefore, the forty-seventh, and the forty-ninth; the sixty-fourth, article six, and sixty-fifth; the seventh, article eight, and eighty-eighth; the hundred and thirty-ninth, and hundred and fortieth, article six; the hundred and forty-third, and the hundred and forty-sixth, both of which relate to the same woman, as you will see in the twenty-first section of the third book, under observation the forty-eighth. And the same section, observation the fourth, article the ninth, will plainly shew, that it is not another woman, whose case is here pointed out, observation hundred and fifty-five, article four and article ten. And what will you say to this, that one is four times repeated, not only amongst the observations which are distant, but amongst those that are near to each other: for see article four, under observation the forty-sixth, (I mean the former, for soon after, through carelessness, another observation is mark'd with the same number) and immediately read observation the hundred and twenty-eighth, and after this, in observation the hundred and fortieth, article the second, and in the same observation, article the twelfth, and you will easily perceive whether I have said the truth, or not.

But who would not suppose, that repetitions were, at least, avoided in the additamenta which are subjoin'd to this first section? Yet, if you compare the third observation with the sixth, you will perceive, that both of them are only one and the same. And this you will evidently see, if, when you have read the eighteenth observation, article one, two, and three, and the scholium that is added, you return to the observations which Bonetus himself had given us under number ninety-three, and ninety-two, except that the last, which is the observation of Willis, he seems to have ascrib'd to Ballonius. But the nineteenth is also the same with that which follows next in Bonetus, the ninety-fourth; as if the question were only of copying over again, in order, those which are already given above, and not of adding new ones: and so far are the readers from being put in mind, at observation the thirteenth, and twenty-sixth, that the former history seems to be of one and the same man, taken here from Dominic de Marchettis; and in Bonetus under number hundred and four, from Peter the father of Dominic; nor that Stephanus

Blancardus,

Blancardus, who at other times profess'd "to have mix'd up, from the relation of others," what he himself had not observ'd (*b*), that he, I say, had not taken the twenty-sixth observation from any other source, than from the observations publish'd so many years before by Riverius, and was therefore the same, which Bonetus had produc'd before Blancardus under number hundred and twenty-three; unless that Bonetus, indeed, mention'd Riverius's name, nor interpolated his words, but omitted many things in the history of the disease, and both of them some circumstances in the dissection of the body.

3. But if all the observations of this section had been more accurately distributed under certain heads, the reading of them would not only have been more useful to others, but it would have much less easily happen'd to the collectors, that any thing should slip their memories. Since, therefore, it is my fix'd resolution to repeat nothing, a certain order is requisite here, whereby to describe the observations of Vallalva, and mine, which relate more to the subjects at present treated of, than to others. For although I had many besides, in which, among other disagreeable symptoms, that of injur'd respiration is also taken notice of; yet all those, which seem'd to be more referable to other sections, to other sections I refer'd, and the remainder I plac'd by themselves here. And not to depart from the scheme I hinted at above, I believe it will not be improper to divide them in the following manner: that is, first to produce those in which the principal cause of injur'd respiration is on the outside of the thorax; then those, in which the principal cause is within the thorax; and of these again, those first, in which it is in the lungs; then, finally, those in which it is within the thorax, indeed, but on the outside of the lungs.

And as when the cause is on the outside of the thorax, it has its seat chiefly either in the head, the belly, or the neck, I chuse to begin from the head.

4. Willis, indeed, has greatly illustrated the doctrine of the medical schools, in regard to the convulsive asthma, and has confirm'd it by his own observations, taken, in particular, from those, who, unless they always kept their heads erect, or prone, became "immediately panting, and breath'd as if "they were just at the point of death," whenever they mov'd their heads backwards, or lay down supinely; and that from no other cause, but from a great quantity of acrid serum, which was found by dissection within their heads, falling down towards the origin of the nerves which go to the lungs, while they reclin'd their heads, in the manner I have said, and pressing vehemently thereon; as you will know from the hundred and forty-fourth observation of this first section.

But it would have been much better for Willis to have omitted what you will read in the scholium subjoin'd to the same observation; I mean, "that "the ancient physicians had acknowledg'd only the first species of asthma, "which proceeds entirely from the air-carrying ducts being obstructed, or "not being sufficiently open;" but that they had been entirely ignorant of the other species, that is, the convulsive, inasmuch as they were accusom'd, in asthmas of this kind, "to ascribe them to vapours from the spleen, uterus,

"mesentery, or some one of the other viscera, without any justice whatever." But to pass over the passages of Galen, and even of Hippocrates, and what his interpreters have written upon the sixty-eighth aphorism of the fourth section, (for the words of Avicenna, which I have likewise seen produc'd (c), relate to an asthma, indeed, "from the nerves, and the beginning of the "spinal marrow, and the brain," but to an asthma brought on by "a catarrh," and not by a convulsion) I will appeal here to no other testimony than those which you may see in the Sepulchretum itself. See, therefore, the scholia to the next observation under number hundred and sixty, and also under number hundred and sixty-five. For in the scholium to the first of these observations, the question being of the orthopnea, from a calculus of the kidney, Ballonius says, "The cause of this secondary disorder they will "have to be, that there is a little nerve from the sixth pair, which goes "through the diaphragm, and creeps on quite to the kidneys; and this being "oppress'd, not only brings on a sense of stupor in the opposite thigh, but "may also bring on some difficulty of respiration in the upper parts." And in the scholium to the other observation, Platerus says, "The larger nerves, "and especially those of the diaphragm, which proceed from the medulla "spinalis of the back, being separately and solitarily infested with desfluxions, "or other disorders, bring on a kind of dyspnœa: such as, in asthmatic "complaints, I have observ'd immediately to attack the patient, when no "other marks of the lungs being affected appear'd." Now, then, do these ancient physicians speak of vapours in this place, or of disorders of the nerves? Or do they seem to be entirely ignorant of any other species of asthma, but that first, which arises from the bronchia being obstructed, or compress'd? See, I beseech you, what Willis himself says in the same scholium, a little below the words of Platerus: "In proportion as the nerves "of the diaphragm are prevented from rightly performing their offices, or "their offices are perverted, difficult respiration of different kinds is produc'd." Did not Platerus say the same? And below: "The reason that "a difficult respiration succeeds, now and then, to a perturbation of the "spleen, in hypochondriac persons, is, that the splenic nerves communicate "with the pulmonary." And is difficult respiration deduc'd, by any other kind of explication, from the perturbation of the kidney, by Ballonius?

I confess I am ignorant, by what method Vesalius would have explain'd, that which he observ'd in a hydrocephalous little girl, mention'd in the former book of the Sepulchretum (d), "that as often as the head was mov'd by "those who were about the girl, and was a little rais'd, although but slightly, "immediately a violent cough was troublesome to the patient, join'd with a "difficult respiration." Yet I believe, nevertheless, that he would not have accounted for this appearance from vapours, nor from a catarrh running down "immediately," through the nerves into the lungs; especially as he had, indeed, observ'd some diseas'd appearance in the brain, and some other viscera, but no disorder at all in the lungs.

5. However, I would have you understand these things in such a manner as to suppose, that I intend only to ascribe to every one his due praise; and

(c) Canon. l. 3. Fen. non 9. fed 10. tr. i. c. 38.

(d) Sect. 16. obs. 6.

not that any thing is detracted from Willis. Before whom it is rather surprising, that the physicians did not more generally conceive, what we have all very well understood since his time. For, as since the very time in which men first existed, it was natural to observe, how soon, and how evidently, respiration may be chang'd from terror, anger, joy, grief, and weeping; and as the very ancient author of the book, *De Morbo sacro* (e), expressly, and justly, has admonish'd us, "that pleasure, gladness, laughter, and sport, and, "in like manner, griefs, anxieties, sadnesses, howlings, and complaints, "happen to us, from no other part than the brain;" it seems, in fact, that from these things it should have been obvious to physicians, what power the brain has upon respiration, when somewhat mov'd by the natural workings of the mind only, or the daily passions with which it is affected; and, that the same, and much more, it must consequently have, when it is irritated, and press'd by the more vehement force of a disease. The effect of which force Willis both plainly saw, and clearly explain'd; sometimes attending to it in the brain, sometimes in the appendages of the brain, the spinal marrow, and nerves; sometimes accounting for convulsions, and sometimes palfies, therefrom; and sometimes determining one or the other of these causes to consist in the internal fibres of the lungs, and sometimes in the diaphragm, or the other muscles, serving to respiration. But I shall now give you two observations, the one Valsalva's, and the other mine, which relate to difficult respiration in general.

6. A man of forty years of age had escap'd from an acute fever, attended with a delirium, and a soporific disorder, when a little after, many irregularities being committed in food, drink, and continual handling of hemp, he was again oblig'd to take to his bed, having his respiration so much injur'd, that he breath'd with his neck erect, and that with a wheezing, and great tumefaction of the abdomen. He spoke with difficulty, and at intervals, that is, during the time of expiration. He had a cough, and felt a great heat in his fauces: he had pain, not in the internal, but in the external parts of his belly and thorax; and he was tortur'd with continual watchings. At length, four or five hours after taking a bolus, in which there was opium, not being able to continue in bed any longer, he got up and walk'd about; but soon after going to bed again he suddenly died.

His abdomen and chest being open'd, the other viscera were all found, and in proper condition, except the lungs; and even in them, nothing else was observ'd, but that they were very turgid with air, and were distinguish'd, here and there, with black spots. The blood was, in general, of its natural fluidity, except a little polypous concretion, that was contain'd within the right ventricle of the heart. But when the skull was open'd, first, a gelatinous concretion of serum was seen, about the sanguiferous vessels, that crept through the pia mater: in the next place, a limpid serum filling the lateral ventricles of the brain, which kind of serum was also found within the first vertebræ, about the spinal marrow: last of all, the compages of the brain itself was observ'd to be more lax than it naturally is.

(e) N. 16.

7. Although some persons might certainly suspect, according to what I have mention'd to you, when I was writing on another occasion (*f*), that as the dust of the hemp, in which this man had work'd, by irritating the fauces, had excited a cough and sense of heat, so also by insinuating itself into the lungs, and irritating them, had, in great measure, brought on the orthopnoea; yet the dissection shew'd the contrary. Nor were "the vesicles of the lungs" found here "quite choak'd up with small dust," as in that asthmatic man, who had made it his business to dress and cleanse feathers with which beds are stuff'd, from their dust, as you have it in the additamenta to this section (*g*); but there was nothing, besides those black spots, which though Valsalva took into consideration, he did not think had any reference to the disorder, inasmuch as he found it sufficiently inherent in the brain. But shall we say that this cause, inhering in the brain, brought on so great a difficulty of respiration, by giving rise to a convulsion of the muscles, or to a palsy? Some signs are not wanting, which might make us believe, that it acted by inducing a palsy. For if you believe, that the fibres of the lungs were resolv'd; you will easily conceive, that they could not have been able to expel the air, and for that reason, were found to be very turgid; and in like manner, why, when opium was given, the disorder became more violent, and death follow'd, the fibres, doubtless, being more and more relax'd thereby: and it would seem, that if they had been distended by a convulsion, they must have reap'd advantage, rather than injury, from the administration of the opium. Nor was the external pain of his belly, and thorax, more the proof of a convulsion, than of laxity; the muscles themselves, doubtless, and the neighbouring parts, being relax'd and distracted, by reason of their constant and violent exertions in a respiration of this kind. But whether it seems to you, that this question ought to be determin'd, in this, or in any other manner; it cannot be debated, in regard to my observation, by reason of the same diseas'd appearances being wanting: the observation is as follows.

8. A woman about forty years of age, the mother of children, whose disorders of the left eye I have describ'd to you, in a former letter (*b*), being suppos'd, (for certain reasons which I could not learn, though I enquir'd) by the physicians who had attended her, to labour under an infarction of the lungs, having at length died in the hospital; the pulse having been, in the last days of her life, low, her face red, and having been attack'd with no delirium, and no soporific affection; was very accurately dissected by me, about the beginning of April, in the year 1741, as I was at that time, according to my custom, making many and various anatomical researches.

In the abdomen we found nothing which was preternatural, if you except the left testis, and the fund of the uterus: for the first was distended with an internal hydatid, and equall'd the bigness of a chestnut; and the latter, in a certain part of its internal anterior surface, and in like manner, in another part of its posterior surface, grew out into a substance, of a brownish red colour, unequal on its superficies, of a roundish circumference, and of a moderate height. The thorax contain'd lungs that were entirely healthy and sound, in their appearance, and the heart also. But the brain, if ever it did

(*f*) Epist. 7. n. 14.(*g*) Obf. 4. § 2.(*b*) Epist. 13. n. 9.

in any case, shew'd all the vessels that run through the pia mater to be turgid with blood; and a great quantity of blood was also in those which pass through the medullary substance. However, notwithstanding the cerebellum was very lax, the cerebrum itself was not lax.

9. It is surprising, that this woman was neither delirious, nor lethargic, as I said, in the last days of her life. Could the reason of this be, that, before the last disorder, the vessels of the brain had been accusom'd to be somewhat more distended than was natural? For in this manner you might account for both circumstances, and understand why she suffer'd less than others from the distension of the vessels being encreas'd in the latter part of the disease; and why from this distension, in the former part of her disorder, which perhaps was greater at the origins of those nerves that serve the organs of respiration, they, being more compress'd than usual, disturb'd the functions of the lungs, just as if they had really been stuff'd up with pituita.

And do not say, that, if it had been thus, the woman would certainly have complain'd of her head more than her chest, or at least equally as much; for she might, or she might not have complain'd, as I was of necessity ignorant what complaints she had been previously subject to. I will tell you what was written by Valsalva, in a consilium, or medical opinion, for a certain nobleman, who being well in his head, was first attack'd with convulsions in his testes, after that in the whole belly, as it were, and finally in his head. He affirm'd, for instance, that he had frequently found in those cases, by dissection, that the origin of the convulsions was in the brain itself, although there had been no mark of this being affected, even at the time of the convulsions; and that the other parts which had been convuls'd, or affected with pain, he had found without the least mark of injury, though he had examin'd them with the utmost care. To this he also added, that in cases of wounds, threatening convulsions were frequently foretold, not by a preceding pain in them, but by a preceding pain in the pharynx (*i*); notwithstanding it is very certain, that the cause of the pain, and convulsions, was not in the pharynx, but in the wounds: on which subject you may also see the observations of Wepfer (*k*), even in the Sepulchretum. Wherefore, when respiration becomes difficult from a disorder of the nerves, although it is then, indeed, more easily distinguish'd, if, the signs of other causes being absent, the head is affected; yet it sometimes happens, that the disorder is originally from the head, when that seems altogether uninjur'd.

10. However, it is also frequently evident, that in very acute pains the respiration may be disturb'd, from the fault of the nerves, without having it in our power to lay any part of the disorder to the charge of the brain. For we see, that whatever part of the body is seiz'd upon by these pains, the respiration is immediately affected. Therefore, whether the nerves, which contribute to the business of respiration, or, in short, those which are connected with them, are very sharply irritated, or press'd, or obstructed, or internally perverted; it is plain, that, from one or the other of these nerves, respiration may be injur'd. And the first, indeed, to omit the ancient experiments of

(*i*) Vid. Epist. 54. n. 2. & seq.

(*k*) L. 1. f. 13. in Addit. Obs. 2. & in Schol.

Galen, upon the costal nerves (*l*), and to attend only to the late experiments, which you have here in the Sepulchretum (*m*), made by Lower, on the phrenics; and the first, I say, that is, these phrenics, being incis'd, the same kind of respiration is immediately brought on, which we see in asthmatic horses: so that Lower, with great propriety, accounted for this disorder in horses, from these nerves being distracted by the diaphragm's being too much depress'd, and suffering "relaxation," or "extension, beyond their proper tone." But to what purpose is it to say any thing of the nerves that are connected with those which serve to respiration? since we see, almost every day, that when these are irritated, they hurt respiration, as in hypochondriacal men, but still more in hysterical women. And I have even shewn above (*n*), from Ballonius, that he had explain'd an orthopnoea, from the calculus of the kidneys, in the same manner. But after Willis had pursu'd more at large the effects of convuls'd nerves, in any and all of the distant parts of the body, the greatest part of physicians not only began to follow this doctrine of his, when it was necessary they should, but frequently even, entic'd by the facility and convenience of it, and sometimes deceiv'd by the fallacious appearance of circumstances, abus'd it to so great a degree, that even when disorders of the organs were not wanting, they accus'd nothing but convulsions, in many disorders, especially those in which respiration was concern'd; just in the same manner as the ancients, for the most part, accus'd vapours. And how easy it is to fall into this abuse, unless we are very cautious, more than one history, in future letters, will shew (*o*).

11. But now, in regard to the present history, after that the cause of the difficult respiration has been consider'd in the head, it follows, that it must be equally consider'd in the belly; and this I shall dispatch in a few words, as it is a subject that has been much spoken of, even from the earliest times. For you see, that Galen is commended here in the Sepulchretum (*p*), as expressly teaching it, in certain affections of the stomach, liver, spleen, or a part of the belly, which is connected with the organs of respiration. We set aside convulsions here, of which, and even those that have their origin from a viscus of the belly, I have already spoken sufficiently above, when opportunity offer'd. Let there be no convulsion in a hypochondriac man; only let the stomach, or the intestines nearest to it, be turgid with flatus; they will certainly be in the way of the descending diaphragm, in the action of inspiration. So in that asthmatic matron, concerning whom is the hundred and forty-seventh observation of this section, they found that the lungs "were in very good condition; but that all the intestines," and especially the jejunum, were surprisngly "inflated and distended." And the liver, being preternaturally increas'd, will not only be in the way of the descending diaphragm by its bulk, but also, by its weight, will be injurious to its ascent; wherefore, it will be injurious both to inspiration and expiration. Hence you have examples of a dyspnoea, from the increase of bulk in the liver, in the same section (*q*): nor are examples wanting of the same disorder, from the

(*l*) De Anatomic. Administ. l. 8. c. 4.

(*m*) Append. ad Obf. 110.

(*n*) N. 4.

(*o*) Epist. 17. n. 26. & Epist. 18. n. 17. & seq.

(*p*) In Schol. ad Ob. 138.

(*q*) Ut in Additam. Obf. 12. & 17.

increas'd

increas'd bulk of other viscera of the abdomen, either of such as are connected with the diaphragm, or only subjected thereto: amongst which I particularly remember one, that Albertini related to me, when I was a young man.

A certain person at Genoa was troubl'd with an asthma, in regard to the cause of which his physician did not doubt, but it was contain'd in the cavity of the thorax. When Albertini was consulted, he suspected that the cause rather lay hid in the abdomen, nor far from the diaphragm, by reason of a certain symptom in the stomach while he took food, or after taking it; for I do not certainly remember the circumstance. But this I remember, that the patient at length dying, an account of his dissection was sent by his learn'd and ingenious physician to Albertini, which prov'd his conjecture; for there was a disease in the pancreas, which had grown out into many tumours, resembling so many apples, and even verging to the nature of a cancer. But Valsalva's observations, and mine, relative hereto, you will have on another occasion; because, on account of other disorders, besides those of respiration, it is better to reserve them for another place; and among them you will have some, to which, by reason of an injury of the stomach, in appearance slight, a great difficulty of respiration was join'd.

It will be sufficient here to put you in mind of one thing; that, by reason of the common boundaries of the lower part of the thorax, and the upper part of the belly, not sufficiently attended to by many physicians, some not rememb'ring, and others not being acquainted with them, they are frequently not aware, how high within the diaphragm, which is the lower boundary of the cavity of the thorax, the upper part of the cavity of the abdomen, with its highest viscera, penetrates; wherefore, it frequently happens, not only in other disorders, but particularly in the disorders of respiration, that the cause which really belongs to the belly, is wrongfully ascrib'd to the thorax.

17. But in the neck, although the cause of difficult respiration, consisting in the semi-obstruction, or compression, of the trunk of the *aspera arteria*, is wont, for the most part, to be obvious, as when some things that are taken down do not enter the pharynx, but perhaps fall into the larynx, or when some hard tumour grows near that tube, histories of which kind are not wanting, in the *Sepulchretum*; nevertheless, it sometimes happens, that obstruction, and in like manner, compression, may lie hid, so as to be less distinguish'd from the relation of the patient, or the inspection of the physician, than from conjecture. And to this species belong the appearances formerly observ'd by the celebrated Fantonus(r), "in the body of a man, "where the arytenoid cartilages were ulcerated around, and their thicknes "so increas'd, that there was a very narrow passage remaining in the larynx, "and the patient breath'd with great difficulty, though he liv'd a long time "in this way." And to the same purpose are two not contemptible observations; the one common to Valsalva and me, and the other proper to our *Mediavia*. The first of which was made upon that virgin, in whom I first saw the foramen of the hymen divided into two parts, by a kind of band, of the same substance; such a one as I know I have describ'd in the *Adver-*

(r) *Anat. corp. hum. Diff. 13.*

faria, from other observations that are afterwards added (*s*), and again taken notice of, together with the columnæ disjoin'd from the hymen, and those carunculæ which some now call the *pisiform* caruncles; in such a manner, however, that I am ignorant of having propos'd it as natural, or not wanting the assistance of a surgeon, as the same persons assert, and some other things also, of which it is not a proper place to treat here.

13. The virgin, therefore, of whom I have just spoken, being forty years of age, and having been for a long time asthmatic, and having her voice, moreover, much diminish'd, was suppos'd by her physicians, beyond a doubt, to have a disorder of the lungs, when the asthma attacking her very vehemently, she suddenly died, and was brought by the students into the anatomical theatre at Bologna, in the year 1704. The viscera of the belly had nothing of a preternatural appearance, if you except the testes being a little larger than usual, hard, white, and entirely schirrhous, and having some hydatids lying upon them. But in the thorax, and the lungs themselves, was no appearance of disease; so that no body doubted, now, but the cause of the disease would be found entirely within the cranium. Yet even there every thing was found to be in good condition. Every-one was astonish'd, who had diligently inspected the viscera, as they were dissected in their order, but still more we, who had perform'd the dissection; when I said to Valsalva, let us also open the larynx, that we may see whether, perhaps, the causes of the voice being diminish'd, the asthma, and death itself, might not lie lurking there: for at that time the larynx was not open'd in the public demonstrations, to shew the *horizontal* glottis, the ventricles, or sinusses of the larynx, the arytenoid glands, and the joints of the arytenoid cartilages, which I had not yet discover'd, or restor'd. Valsalva having consented, I order'd the larynx to be look'd for among the parts that were not yet buried, and to be brought to me. And having cut it down, on the posterior part, in a longitudinal direction, and laid it open by drawing the lips asunder, what we enquir'd after was immediately manifest. For a pus of a white, degenerating into a cineritious, colour, and of a pultice-like consistence, form'd into the shape of a cork, entirely shut up the cavity of the larynx, that lies below the glottis; and in that place the coat investing the larynx was ulcerated, as it was in like manner, where it cover'd some of the nearest annular cartilages of the trachea arteria, although here more slightly. And these things being demonstrated in the theatre, on the last day of public dissection, gave great satisfaction to all who were present.

14. As I was afterwards considering from whence so great a quantity of pus of this kind could have been collect'd in that place, so as entirely to stop up the passage, I began to cut into many larynxes, and accurately examine them; and seeing, not only the glands that lie thick beneath the internal coat, but also in the cavities of the ventricles, into which this coat is produc'd, both glands of the same kind, and the inferior covering crus of the arytenoid glands, I readily conjectur'd, that in respect to the ulceration in the virgin I spoke of, as it was manifest beneath, so it might perhaps lie hid in the ventricles; and that the pus in these might grow viscid from stag-

nation, especially when the body was compos'd to sleep, and at length become very dense, and afterwards be discharg'd in speaking, and be added to that which flow'd down from the neighb'ring parietes of the larynx, and aspera arteria; so, by more or less obstructing the air, that it had made respiration more or less difficult, till it was at length discharg'd on both sides, in such a quantity, and with such a density, from the ventricles, that it could not be diverted from thence, and thrown out by expiration: just as Mentzelius saw it happen of a sudden (*t*), from a small portion of very thick pituita, which was by chance harb'ring itself between the two first rings of the aspera arteria, and thereby closely and firmly shutting it up, in a girl, in other respects healthy, and in the vigour of life. But in the virgin at present in question, who was neither young and in the bloom of life, nor healthy, the purulent spittings, the cough, and the sense of erosion in the larynx, which I believe were not wanting, and the difficulty of respiration, together with the diminution of voice, which certainly were not wanting, belied an ulceration of the lungs: nor could any thing but an accurate enquiry into the other symptoms which shew the lungs to be affected, as for instance, whether the matter which was thrown up was perceiv'd to ascend from a pretty deep situation; whether there was a sense of weight, or compression, in the thorax; whether lying on the back, or on the side, was difficult; whether going up steep places was troublesome; and whatever other marks of this kind there may be, which ought to be attended to the more, the more they are in number; nor could any thing, I say, but the enquiry into these symptoms, and the absence of them, together with a constant pain in the larynx, which had continu'd from the very beginning through the whole of the disease, incline the physician to conjecture that which was really the case; although even then it was very difficult to conjecture what there had hitherto been no example of extant.

The first advantage, therefore, you will draw from the history I have given you, is to suspect, that what has been once observ'd, may, perhaps, once again, and even frequently, happen, in patients of this kind; and in the second place you will draw this advantage, not to be over-hasty in pronouncing, from the dissections of dead bodies, that there was no cause of the disease, which came under the notice of the senses, for which reason that is to be refer'd to internal convulsions, or other affections of that kind, which may be owing to invisible corpuscles. And this without doubt would have been done, in the case in question, if it had not by accident come into my mind, after having examin'd other parts, last of all to examine this little part, the larynx: and I would have you always take care, not to omit the inspection of this part, when you would wish to explore the causes of disorder'd respiration, or sudden death, which seem'd to have happen'd from suffocation. But now let us come to the other observation.

15. A woman of more than eighty years of age, had complain'd, already, for many days, of a difficulty of breathing, and swallowing, join'd with a heat of the fauces, when she was at length receiv'd into the hospital at Padua. There she was seiz'd with so violent a paroxysm of difficult respiration,

that she was almost kill'd thereby. She did, however, recover, and had an ill-smelling pus mix'd with blood, discharg'd by spitting, in consequence of the paroxysm. As the woman not only pointed out the larynx, for the seat of the disease, but also drew it forwards, by laying hold of it with her fingers, and by that means fetch'd her breath somewhat more easily; the fauces were inspected; and the uvula indeed, and the muscular arches that ascend up to it, seem'd to be driven backwards, so that the orifice of the pharynx, which opens into the mouth, seem'd much dilated, and those parts were a little more red than usual; but nothing else was to be seen. Thus for fifteen days, or more, the woman went on with those spittings, and difficulty of breathing, till at length this difficulty encreasing, and becoming more and more violent, she was constrain'd, in spite of all remedies, to yield to her fate, which happen'd about the beginning of September, in the year 1725.

The neck, in which it was evident, that the cause of the disorder lay hid, was dissected, and the cause was found to exist after this manner. On the back part of the aspera arteria, at the distance of a finger's breadth below the cricoid cartilage, a tumour had grown out to the bigness of half a walnut, pressing upon the gula which lay behind it; but still more upon the trachea itself, so that the passage in this part was made extremely narrow, and consisted only of a kind of oblong fissure. When this was dilated, the cavity of the tumour was found to be fill'd with a putrid matter, and contain'd within a kind of involucrum, internally hard, and externally made up of certain granules like millet-seed, and of a yellowish colour. And of this same kind of granules consisted two glands also, situated near to the tumour externally, each of which was as big as a moderately-siz'd pea; so that from one, like these, but more encreas'd, it appear'd that the tumour was brought on. By carrying on the incision, from the œsophagus to the pharynx, this part was found to be very rugous internally, yet not so contracted, but that with the fingers it might be all laid smooth, and the pharynx, by this means, reduc'd to its proper size and extension.

16. The appearances found in the dead body very readily explain, of themselves, what had been before observ'd in the living; as for instance, when she was brought almost to death's door, by the tumour which was exceedingly distended with pus, being just at the point of breaking; or when by drawing the aspera arteria forwards with her fingers, she by that means drew the tumour from the œsophagus, and even from the vertebræ, that press'd it back again upon the trachea, and thus caus'd it to press less upon the air-passages.

Yet perhaps you will ask me two questions; one, why this tumour, although previously diminish'd, in its magnitude, by the discharge of the pus, should be the occasion of the woman's death? and the other, what these glands were, three of which, and one in particular, had been so much enlarg'd? And the last of these circumstances you will very well conceive of, if by taking the Adversaria into your hands you inspect what I formerly describ'd (u), on the back of the aspera arteria, and what I observ'd (x), in regard to those glands sometimes being tumefied, though in a less degree than

(u) Advers. 1. Tab. 2. Fig. 1.

(x) Advers. 5. Animad. 39.

the largest that I have describ'd in the present history. And the first of them you will ascribe, partly to the matter at that time collected in the tumour, and partly to that which had fall'n down from thence into the bronchia; for the first, as was evidently seen, left a very narrow passage for the air, and the last, perhaps, being carried back thither by the expir'd air, made it, in the mean time, more narrow; so that the woman by age, disease, and the small quantity of aliment, which by reason of the difficulty she had in swallowing, she was able to take, join'd with the difficulty of respiration, was brought gradually to her end. However, from this very difficulty of swallowing, the pharynx having been for a long time almost unemploy'd, it may reasonably seem, that it had contracted itself, internally, into wrinkles. And with this history you will join that, which *Virus Riedlinus* (y) has related, "of a particle of grumous blood, that had acquir'd almost the hardness of a stone, found near the *aspera arteria*, and compressing it," in an old man, who having had a terrible fall, a few years before, had first a pain of that part, from the very time he had fall'n, and always afterwards a difficult respiration. And from the tenour of both histories, you will very easily agree with *Gabrielius* (z), who judg'd, that an orthopnoea, join'd with a sense of strangulating matter, in the fauces, and an interception of the voice, which was critically solv'd, by the discharge of thirty worms, had been owing to those worms distending the oesophagus, and pressing upon the trachea; especially as in another, who had died suddenly from an orthopnoea of the same kind, he had seen a great number of worms occupying the gula, and even the trachea that lay close to it, into which they had made a way for themselves by gnawing.

But although a pressure from behind more readily and more effectually streightens the trachea, inasmuch as it is not defended on that surface by cartilages; yet, if any very strong pressure happen on the fore-part, it may so contringe this tube, as to bring on a difficult respiration, and at length death itself; as the *farcoma* observ'd by *Vorwaltner* (a), and "the gland thymus enlarg'd and fill'd with chalky concretions," remark'd by *Christian Vater* (b): so that there was no occasion to call in the aid of polypi of the heart, in order to explain the death of the child; since the upper part of the sternum did not suffer part of the thymus, nor yet that *farcoma*, which was "in the neck under the sternum," to grow out forwards; and so the increase of each of the tumours necessarily forc'd the trachea towards the vertebræ, and at length shut up all access to the air.

17. Hitherto I have written of the causes producing difficult respiration which lie in the head, the neck, or the belly. Now let me add some things upon this subject, when the cause lies within the thorax itself: although, indeed, those observations which I just mention'd relate, in part, to the thorax, as two observations of *Laubius* do entirely; the one of a *vomica* adhering to the posterior part of the *aspera arteria*, about the beginning of its division, which had an acute and rough calculus included in it; the other of a large *steatoma*, wherein the trachea was comprehended: which observations, as

(y) Eph. N. C. Dec. 3. a. 7. obs. 120.

(a) Ibid. Obs. 144.

(z) Ibid. Obs. 188.

(b) Dec. ead. 3 a. 9. Obs. 161. in fin.

they contain other things worthy to be consider'd, you will read in the *Censuræ* (c) *Cæsareæ N. C. Academiæ*. For I am now in haste to go on to the enquiry into these causes, which are inhærent in the lungs themselves. And no-body can, in the least, doubt, but that all things, which either too much compress, or stuff up, or render inflexible and rigid, the cells of the lungs, and the slender and small canals, through which the air passes, must, at the same time, be injurious to respiration. And they are too much compress'd, for instance, when the blood distends the vessels that lie around these parts, either by being in too great a quantity, or being too much rarefied, or, from any other obstructing cause whatever, passes with difficulty through the lungs: the first of which happens in plethoric persons, especially when they go faster than usual, and increase the motion of their blood; the second in ardent fevers; and the third seems to have happen'd in a princess (d), who being seiz'd with a great difficulty of respiration, had the vessels of her lungs "swell'd even to blackness."

And as to infarction, besides the humours which are secreted from the bronchial glands, and are sometimes too viscid, or in too great a quantity; a very fine dust, which is continually drawn in with the air, as in the feather-dresser, of whom I spoke above (e), and still more in cutters, masons, and carvers of stone, whose lungs being very hard, when they were cut into, the knife seem'd to be drawn, "as it were, through a heap of sand," as you will read in like manner in the *Sepulchretum* (f); I say, besides the humours of the part being vitiated, or increas'd, these or such-like causes will contribute to stuff up the lungs. And as these causes render the lungs hard, so they make them inflexible, and inexplicable, that is, incapable of dilatation; the first of which is evidently injurious to expiration, and the other to inspiration.

18. But the same may also happen from causes that are generated within the lungs, as from those that are generated on the outside, and taken in with the air; and these may be of such a kind, as to stuff up the bronchia, at the same time, or not. For I have observ'd, as I pursu'd the bronchia in dissections, that their cartilages sometimes became bony, even before the person was far advanc'd in age. For that the lungs "grow hard," and become earthy," in decrepid age, Aristotle knew (g); but Littre (h), and Vieussens (i), the first in a man of eighty years old, and the other in a matron some years older, have written, that some, or all, the annular cartilages of the bronchia were become bony; although neither of them has expressly told us, whether they meant, when they said *annuli*, to have it understood, that these appearances were found deep within the lungs. I, however, have seen it, and can still shew it, even in the most internal parts of the lungs, where, in the place of every annulus, many little bits of cartilage are naturally connected together; although some of those, who have very learnedly collected examples of all the parts of the human body that are

(c) IX. Obs. 15. & VII. Obs. 40.

(d) Eph. earund. Cent. 8. Obs. 79.

(e) N. 7.

(f) Addit. ad hanc Sect. Obs. 4.

(g) De Juvent. c. 14.

(h) Hist. de l'Acad. R. des Sc. a. 1706;

Obs. Anat. 7.

(i) Traité de la struct. du coeur, ch. 16.

sometimes found to become bony, have not only omitted to mention these, and the pleura, and the internal parts of the eye, which I have seen in some measure bony, (*k*), but even those parts that are much more frequently to be met with in that state; I mean, the cartilages of the trunk of the *aspera arteria*. However, I should hardly suppose, that what is quoted from our Columbus, here, in the *Sepulchretum* (*l*), is referable to my observation, but rather to the coats of the vessels; because he says, that he had seen “bones, of no inconsiderable size, in the lungs.”

19. And that the bronchia may be, at the same time, render'd inflexible, and be stuff'd up, from causes generated within the lungs, you will very easily conceive, if you do but recollect, that calculi are generated within the bronchia. I am not ignorant, indeed, that the bronchial glands sometimes grow hard, like a calx, or gypsum, as well within the lungs, as without. Yet I believe that the same happens much more frequently from a tough humour, or pus, too long retain'd in the cells of the lungs; and in the ramifications of the bronchia, I know it for certain. And if you do but read, as I did lately, the greatest part of the histories, in which almost a hundred authors have describ'd calculi, or topi, that have been brought up by coughing, or found in the lungs, without doubt you will agree with me. You will see many pointed out by Rhodius (*m*), others by Henry Meibomius (*n*), others by Sachsius (*o*), the last but one of which, that you may not be detain'd by a typographical error, I would have you be inform'd, is one of Paavius's: but, to omit others, you will see a great number in Scenck (*p*), who not only pointed out, before them, what he could at that time, but also describ'd them. And although even some observations from Crucius, Blasius, Saxonia, and Gendrotius, are transferr'd into this first section of the *Sepulchretum*, which, as far as I remember, are not pointed out by others; yet besides those, which, as they are giv'n without dissections, do not belong to the present purpose, I have observ'd some, both in that and the following sections of the *Sepulchretum*, to be omitted, which might have been taken from the writers just now commended, or from some of the volumes of the *Cæsarean Academy* (*q*), at that time publish'd, and in like manner from others, as from Contulus (*r*), and still more from Morton (*s*); not to say any thing of those books which had not yet come out at that time, as the *Centurie* (*t*), and the *Acta* (*u*) of the same academy, the *Commercium Litterarium* (*x*), and others.

20. But as you are now, perhaps, without the greatest part of them, and as the whole of the subject deserves to be a little more accurately handl'd; I will give you the chief heads of the histories that I have read over, the amount of which is as follows:

(*k*) Vid. Epist. 21. n. 19. & 22. & Epist. 13. n. 9, 10. & Epist. 52. n. 30, 31.

(*l*) Obf. 46. primæ § 6.

(*m*) Cent. 2. Obf. Med. 3.

(*n*) Exercit. Med. de Obferv. rar. &c. n. 20, 21.

(*o*) Eph. N. C. Dec. 1. a. 2. Obf. 181. in Schol.

(*p*) Obf. Med. rar. l. 2. ubi de Pulm. Calcul. cum Strauffii. Addit.

(*q*) Dec. 3. a. 3. Obf. 71, 72, 248. & a. 4. obf. 109.

(*r*) De Lapidib. Podagr. &c. c. 8.

(*s*) Phthisiolog. l. 3. c. 6. (*t*) III. Obf. 62.

(*u*) Tom. 4. Obf. 49. & Tom. 5. Obf. 68.

(*x*) A. 1743. heb. 13. n. 2.

Since Aristotle (*y*) seem'd to have pointed out calculi, as frequently observ'd in the lungs of victims, and Aretæus (*z*), and Galen (*a*), remark'd small concretions, like hail-stones, cough'd up by men; Trallianus (*b*), and Paulus (*c*), were the first, as far as I know, who saw them thrown up, indurated into true calculi. And our Curtius was the first, as far as I remember at present, who found (*d*) a calculus in the lungs; but whether three times, as some say, I do not remember, as I only remember to have read, "that he had seen, in a dissected body, many little stones generated in the lungs, among which there was one that was almost as big as a pea."

Moreover, as to what relates to their number, Fernelius also found "the lungs (*e*) sometimes stuff'd up with them;" and Gesner (*f*) has taken notice of "a great number" being found in a certain youth, Hildanus (*g*) "a very considerable number" in a woman, Hildenreichius (*h*) "some hundreds" in a student, and Raygerus (*i*) found them "innumerable" in another person; not to speak of others, and those even who have spoken of them being thrown up, of whom it is sufficient to mention two, Hildanus (*k*), who has asserted, that an "infinite number" were discharg'd from the lungs of a consumptive patient; and Boerhaave (*l*), who has asserted, that "four hundred" were discharg'd by Vaillant, and those, to speak also of magnitude, all very small. But, from the magnitude of a millet-seed, they often grow to the size of a lentil, a pea, a vetch, or a bean: and even Benivenius (*m*), and our Prævotius (*n*), saw calculi, that had been cough'd up, the first of which was as big as a filbert-nut, and the other still bigger. And those must have been very large which Koehlerus (*o*) saw, and wonder'd that they could have pass'd through the rimula of the glottis, without causing instant suffocation; and indeed they had hurt the trachea in their passage. Nor did I less wonder lately, when a carman, who came to ask my advice for a dry cough, shew'd me a calculus, which was scarcely less than the stone of a moderately-fiz'd peach, and which he had expectorated with great pain and difficulty; and two others of the bigness of a vetch, that he had discharg'd since; and all of them from the right lobe of the lungs, for he had perceiv'd them to ascend from thence. Yet that which is describ'd by Oethæus (*p*) was so much bigger, as to equal the size of a walnut; and what makes it still more admirable is, that it was expectorated by a girl of fourteen years of age, and without any evident injury being the consequence thereof, if the physicians, however, have taken sufficient care to guard themselves against female fraud. But I can easily believe, that a calculus of the same magnitude, was found within the lungs by Hildanus (*q*), as also one of the bigness of a pigeon's egg, by Contulus (*r*), although he has foolishly abus'd Malpighi's figure of a frog's lungs, in which he would fain represent to us, a human calculus.

(*y*) De Partib. Animal. l. 3. c. 4.

(*z*) Morb. Diut. l. 1. c. 4.

(*a*) (*b*) (*c*) Apud Shenck. cit. supra ad n. 19.

(*d*) Comment. in Mundin. Anat. c. 34. in fin.

(*e*) (*f*) Apud Shenck. loc. cit.

(*g*) Cent. 2. obs. 29.

(*h*) Eph. N. C. Dec. 1. A. 6. obs. 221.

(*i*) Earund. Dec. 3. A. 3. obs. 248.

(*k*) Cent. 6. obs. 22.

(*l*) Prælect. in Instit. § 835.

(*m*) Apud Shenck. l. cit.

(*n*) Vid. Rhodii obs. cit. supra ad n. 19.

(*o*) Commer. Litter. A. 1741. Hebd. 8. in fin.

(*p*) Apud Shenck. l. cit.

(*q*) Obs. cit. supra 29.

(*r*) c. 8. cit. supra ad n. 19.

21. Yet he has some things which ought not to be pass'd over, relating to the hardness of it, the marks, and method of cure, in an incipient calculus. For as these calculi, for the most part, are like the matter which concretes in the joints of arthritic patients, friable, light, like a pumice stone, chalky, and tophaceous, such as I saw from the carman (*§*); and not frequently rather hard, immoderately hard, extremely hard, and scarcely more than once of the hardness of a flint, and of the weight of twenty grains; the calculus I speak of, is said to have been "hard and streaky like marble, and very heavy." And as an asthma and orthopnea are generally found to attend this disease, but still more often, an obstinate and long-continu'd cough, and that, unless an hæmoptoe, or consumption, be join'd to it, dry, for it is very rarely, that there is no cough, as happen'd in the observation of Jo. Francus (*t*), when the lungs were fill'd with little stones; but it is still more extraordinary that a cough is not only not mention'd, but is expressly denied, at any time; not to speak of it being denied, that another (*u*) had ever complain'd of any pain or difficulty of the lungs, in whom they were in like manner fill'd with calculi; however, not dried up, as in the former case, so that they may be suppos'd to have been less irritable as the aforementioned symptoms, I say, are wont not seldom, or indeed generally to attend; Contulus relates, that this young man of his, on being attack'd with a violent cough, had a great quantity of the most limpid water discharg'd from his fauces, and became every day more and more emaciated, having a most acute pain in the middle of his chest, which also increas'd daily, being obstinate and immoveable, as if from a nail which had been driven into that part. I am not ignorant, that he who I said just now had never been troubl'd with any cough, had however labour'd under a continual pain of the lungs, on the right side; and how long, and how great pains of the sides he bore, whom I pointed out above (*x*) from Benivenius: and Morton (*y*) has even taught, which he confirms by producing histories of cases, that when with an hæmoptoe, a horrible pain of the chest, resembling much a pleuritic, or peripneumonic complaint, happens about the beginning of a consumption, we may with justice suspect, that this disorder is of the calculous kind. But he says, however, that the calculi, in these cases, are form'd with angles, and sharp points; and certainly even Paulus (*z*), in an hæmoptoeic patient, who threw them up in a rough state, and sharp like the tribuli, (or iron spikes, arm'd with prickles, which were us'd by the ancients to annoy the enemy's horse in battle) has mention'd a pain: but where the calculi are smooth, nor apt to lacerate, altho' they are sometimes pretty large, Morton has assur'd us, that they produce no inconvenience, but a dry cough, and some heaviness in the chest. But neither Francus, Benivenius, nor Contulus, say, that the calculi they had seen were furnish'd with angles, and sharp points; for which reason they brought on no spitting of blood; so that it is natural to imagine, they do not always produce the pain, by pricking, and lacerating; but sometimes by drawing the lungs, by their weight, asunder from

(*t*) n. 20.(*u*) Eph. N. C. Dec. 3. A. 3. obf. 72.(*v*) Earund. Dec. 1. obf. 181.(*x*) n. 20.(*y*) c. cit. supra ad n. 19.(*z*) Apud Shenck. l. cit. supra ad n. 19.

the pleura, or mediastinum, to which they are perhaps connected, and at other times not even in this way, but otherwise. And that they have been sometimes form'd for laceration, but in fact have not once lacerated, nor yet occasion'd any pain, you will understand from what I shall presently subjoin, when I have pointed out what Contulus and others have remark'd concerning the method of cure.

When most of the physicians had order'd, that milk should be given to that young man, in order to ease the pain, and to prevent his being emaciated; Albertus Fabrius, the same whom I have before, with great justice, commended (*a*), very resolutely dissenting from their opinion, inasmuch as he was the only one, who guess'd at the real cause of the disorder, and thought that the calculous concretions, in the lungs, might be encreas'd by the use of the milk: and in this opinion Morton (*b*) was afterwards, who, we see, for the same reason, did not permit a milk diet in a phtisis, from calculous concretions in the lungs, unless upon the most urgent necessity: and indeed the man whose lungs I said were found fill'd with small stones, by Francus, was accusom'd to have such a craving appetite, that he drank it even in the stead of water, or beer. But the event prov'd the judgment of Fabrius. For the use of milk encreas'd the calculus, or at least the pain, and hasten'd the patient's death: whereas in another young man, whose disorder Fabrius, from the very same symptoms, attributed to the same cause, he succeeded so far by giving oil of almonds, and other remedies of that kind, even by way of linctus, instead of the milky diet, that the stone was cough'd up, the pain by degrees went away, and perfect health was restor'd. So also Benivenius, by giving pectoral lenients, and mollifying the throat and aspera arteria, saw that the calculus, which I have spoken of, was discharg'd; and that all the pain, together with the dry cough, was remov'd.

22. Wherefore, although when the calculi are even expectorated, patients of this kind perish much more frequently than they recover, either because they have not thrown up all of them, or because they again generate others, or because they receive great injuries from thence, while in the lungs, which bring them into consumptions, or spittings of blood, from one or the other of which, they generally perish, the soft lungs being, doubtless, easily injur'd, even from the very risus, or efforts, made by them to get rid of the calculus, as Boerhaave has rightly taught (*c*); yet examples are not wanting, nor those very rare, of persons who have not only liv'd a long time, after discharging the calculi, as Petrus Borellus (*d*), Richard Morton (*e*), Sebastian Roth (*f*), and Jo. Francus Hildesius (*g*), testify; but have even grown healthy and sound, as some of these very persons seem to have done, and others certainly did, of whom I spoke just now, and whom Trallianus (*b*), Wierus (*i*), and Hestus (*k*), mention; and he in particular who relates of himself, that he was restor'd to health, after travelling, without the use of any medicine, Oswald Gabelchover (*l*). I omit others, and among these

(*a*) Epist. 8. n. 32. & Epist. 10. n. 11.

(*b*) c. indicato.

(*c*) ad § cit. supra ad n. 20.

(*d*) Cent. 1. obs. 67.

(*e*) cit. c. supra ad n. 21.

(*f*) (*g*) (*b*) (*i*) (*k*) (*l*) Apud Schenck. loc. cit. supra ad n. 19.

Pechlinus (*m*), and him whom I have mention'd to you before (*n*), Casp. Desid. Martinettus (*o*); the first of whom saw three calculi, that were cough'd up without any farther inconvenience, and the last two; by which discharge the patient was entirely freed from the asthmaic affections with which he had before been troubled. Yet I cannot omit Zacutus (*p*), and Georg. Wolffg. Wedelius (*q*). For both of them relate examples of those being restor'd to health, who had even discharg'd sharp and rough calculi from the lungs; one, for instance, that was heavy, hard, and oblong, like the bone of the finger, and rough and in like manner, many, some of the bigness of a pea, and one of the bigness of a bean, and all of them with acute angles, and arm'd with three points: and they mention an orthopnoea indeed, that was brought on from the first, and a dry cough; and from the others, a slight hæmoptoe, and cough, that had preceded the discharge; but do not say a word of any pain. Mention of which you will not even find made by those who have given you cases, where death was brought on by rough calculi, besides the other symptoms that had preceded the patient's death. For the colleague of Wierus (*r*) saw a little stone "unequal and rough," Hil-danus, that great one which I spoke of (*s*), that was "rough on all sides," Raygerus (*t*) one "here and there sharp," Jo. Seb. Albrechtus (*u*) twenty, "extremely rough," Jo. Phil. Wolfius (*x*) many more, all "of a very rough form," that had either been cough'd up from the lungs, or were seen in their substance after death. But notwithstanding every one of these authors mentions some complaint or other in these patients, such as phthisis, cough, dyspnoea, hæmoptoe, asthma, and hectic fever, yet no one of them makes the least mention of pain; so that it must have been slight, and not horrible (as Morton has describ'd it (*y*)) although the calculi were not only form'd for laceration; but had even lacerated, in some, as the spitting of blood demonstrates.

23. And, indeed, the blood is discharg'd, sometimes, in so great a quantity, as to kill the patient, as it did that nobleman of whom Dodonæus (*z*) relates, without mentioning any cough, or even pain, that he had often discharg'd a calculus, "which, being generated in the extreme ramifications of the aspera arteria, resembl'd the figure of the place, being oblong in its form, round, and slender, with short little branches here and there hanging to it." On the contrary, another man (*a*) threw up no blood at all, who being troubl'd with a slight dyspnoea, but with no pain, had a great number of tophaceous concretions in each lobe of the lungs, "equal in bigness to pretty large filberts, and having many sharp hooks, which had fix'd themselves into many branches of the bronchia:" that is to say, "Being soft in the beginning, they had taken on, by degrees, the internal figure of the canals that contain'd them, and so had form'd hooks here

(*m*) Aët. Erud. Lipf. A. 1691. M. Maj.

(*n*) Epist. 5. n. 12.

(*o*) Litter. ibid. cit.

(*p*) De Praxi Med. Admir. l. 1. obf. 103.

(*q*) Eph. N. C. Dec. 1. A. 3. obf. 16.

(*r*) Apud Schenck. loco indicato.

(*s*) n. 20.

(*t*) Obf. cit. supra ad eund. n. 20.

(*u*) Aët. N. C. Tom. 4. obf. 49.

(*x*) Earund. Tom. 5. obf. 28.

(*y*) c. cit. supra ad n. 21.

(*z*) Apud Schenck. loc. cit. supra ad n. 19.

(*a*) Commerc. Litter. a. 1743. hebd. 13.

n. 2.

“and there, where a passage open’d from one canal into another.” These things agree very well with the observation of Platerus (*b*), who related, “that he had frequently found, by dissection, pulmonary calculi, at one time smooth, and at another time unequal, and form’d like tophaceous concretions, into the shape of the vessels.”

But now you see at length, after a long, but perhaps not useless, discourse, on the subject of these calculi, that there is no doubt of what I advanc’d in the beginning of it, that calculi have been found, which have concreted in the bronchia. And that in the same bronchia, and in like manner in the cells, in which the last ramifications of the bronchia terminate, the greatest part of those I have mention’d have been also generated, and especially of the very small ones, may easily be believ’d, from the frequent discharge of them from the lungs, without being follow’d with blood and pus. But if the small branches of the bronchia are beset, here and there, with a matter which can so harden, you understand in what manner the lungs may become “lapidescent,” from an internal and inbred cause, and may “resemble stony tophi, or a hard gypseous matter,” such, for instance, as are spoken of in the Sepulchretum (*c*).

24. Finally, not in this manner only, but in others also, the lungs may become hard, as when they are schirrhous, or, what is more rare, when they resemble tendon or flesh; the latter of which changes in the lungs you have examples of, indeed, besides that which you will have given on another occasion (*d*), from Valsalva, in Franciscus Sylvius (*e*), and Jo. Bapt. Fantonus (*f*); and examples of the first you will have from me in another place (*g*); or when they resemble the very substance of boil’d liver itself: and when this is the case, it not only necessarily happens, that the bronchia are stuff’d up, and render’d less flexible, but that they are at the same time greatly compress’d. Yet, as this state of the lungs belongs to the section *De pectoris & laterum dolore*, “Of pain in the breast and sides,” I will put off my observations of this kind, till we come to that section (*b*). And as it would take up too much time here to produce observations relative to the other kinds of changes I have spoken of, it will be sufficient to add one of tophaceous lungs: which you will so much the more willingly receive, as it is not mine, but made by that very great anatomist and physician, Malpighi. For he, when Albertini, from whom I had the relation, was assistant-physician to the hospital of St. Mary de Morte at Bologna, which office he diligently discharg’d, was accusom’d, if any obscure disease happen’d, to go and see the patient, on being ask’d, and declare to Albertini what he thought of the case; as was done in that which I shall immediately subjoin.

25. A woman, being affected with a very slight scabies, but a great consumption of flesh, was now and then troubl’d with a cough, which was never follow’d with any discharge of thick matter, but always with a difficulty of breathing; and whether she lay on her back, or on her right, or her left

(*b*) Sect. hac Sepulchr. 1. in Schol. ad Obs. 41.

(*c*) Sect. ead. Obs. 47. § 1, & 2. & in Addit. Obs. 1.

(*d*) Epist. 17. n. 10.

(*e*) Sect. hac Sepulchr. Obs. 50.

(*f*) Obs. Med. 15.

(*g*) Epist. 18. n. 30. & Epist. 45. n. 23.

(*h*) Vid. Epist. 20. & 21.

side, it was not for that reason either increas'd, or diminish'd. With her neck erect, indeed, she breath'd a little more easily; but then there was a great sense of weight, as it were, hanging from the fauces into the cavity of the thorax, and rend'ring the fauces narrow. It is probable, said Malpighi, that this woman has her lungs, to use his own words, *tartarized*. She having died in this manner, and her chest being open'd, as soon as ever the knife was impress'd upon her lungs, the crasling of them, just as if any one had cut into sandy concretions, evinc'd the truth of Malpighi's diagnosis, which the continu'd dissection also plainly confirm'd.

26. It is not easy to say, with what admiration this dissection was receiv'd by those, who had before heard from Albertini the conjecture of Malpighi: to which he might have been led by very probable reasons, when he attentively consider'd the symptoms, being at the same time assisted by his own observations, and the observations of others, in some measure, also. For it was then committed to print, that with tophaceous and gypseous lungs, besides a difficulty of breathing, "a dry cough" had been join'd (*i*); as also that a man, who had frequently cough'd up calculi, "had perceiv'd, in the "middle of his chest, the pressure of a kind of weight (*k*):" and even that in many who were us'd to complain of "a dry cough, and some kind of "weight pressing upon the breast," as I hinted above (*l*), Morton found in their lungs "smooth cretaceous stones, in great number, and some of them "even pretty large."

I have borne it with great reluctance, when I have happen'd to light on lungs of this kind, that I could not know for certain, what symptoms, and of what kind, they had labour'd under when living; especially in a man who was already growing old, the greatest part of whose sanguiferous vessels being diligently examin'd, a little before the end of the public anatomical demonstrations of the year 1729, I saw the left vertebral artery, rising from the curvature of the aorta itself, between the carotid and subclavian of the same side. In him, one lobe of the lungs was tophaceous, and the right ventricle of the heart, with the annex'd auricle, entirely fill'd with poly-pous concretions, that were firm, hard, and in appearance fleshy; whereas the left auricle, and the ventricle still more, contain'd nothing but a black and semi-concreted blood: and the veins, in like manner, were all greatly distended with blood; whereas the arteries, in proportion to the stature of the man, seem'd to be rather contracted; and the aorta, at its division into the iliaes, and below that, shew'd, here and there, bony lamellæ; but above this division was not the least appearance of that kind any-where. But, as I said, I was entirely ignorant how he had been affected when living, and of what disorder he had died. In the mean while, that you may be the less displeas'd at having fewer observations of Vallalva's and mine, than you might expect, in this letter, let me assure you, that you shall have many in the next. Farewel.

(*i*) Vid. Sepulchret. Sect. hac 1. Obs. 47,
& 1. in Addit.

(*k*) Sect. ead. Obs. 46. primæ § 11,
(*l*) N. 21.

LETTER the SIXTEENTH

Treats of Respiration being injur'd from Causes within the Thorax, and principally from the Dropfy of the Thorax, and Pericardium.

1. **I**T follows now, according to the method I have laid down, that we enquire, what causes, situated within the thorax, indeed, but on the outside of the lungs, may prove injurious to respiration. The chief of these causes which occur relate, and that much more frequently than most persons imagine, either to water being effus'd, or to the dilatation of the heart and the great vessels. You will find many observations, here and there, in this first section of the second book of the *Sepulchretum Anatomicum*, relating to each species of disorder; but a particular dissection of neither. However, to me it seems to be more convenient, and more useful, if, by dividing our observations, I comprehend in this letter what relate to the dropfy of the thorax, and pericardium; but reserve what relate to the aneurism of the heart, and great artery, for the subject of my next letter. Wherefore, as to the first division, there are these nine, which belong to it, from Valsalva.

2. A woman, about two-and-twenty years of age, of a bad habit of body, thirsty, having a slight cough, and spitting up a kind of catarrhus matter, was married. Some days after the nuptials, she was compell'd to take to her bed. Her pulse was quick, frequent, and low; her cough troublesome, with but little expectoration; and her thirst great. Her feet swell'd, and became œdematous; and so much the more, as the disorder became the more violent: and even now her face also, her arms, and her hands, were affected with the same kind of swelling. There was a sense of immoderate heat in the left part of the thorax; sometimes a tightness of the præcordia, and a difficult respiration; so that she was oblig'd, as the disorder increas'd, to breathe with her neck erect. Wherefore, she died within a few days.

The abdomen, being open'd, was found to contain a little serum; but all the viscera were sound, except that the spleen was bigger than it naturally should be. The uterus, also, was dissected; to see if any mark of beginning conception might appear in her, as she had been lately married. And, indeed, there were in the uterus two vesicles, and a kind of unform'd mass. But this consisted of a mucous substance, to which another was join'd, of such a colour, that it was not much unlike coagulated blood, and was entirely free, on all sides, from the parietes of the uterus. On the contrary, the vesicles, one of which was of a magnitude equal to that of a small lentil, and the other to that of a small vetch, were so fix'd to the sides of the
uterus,

uterus, that it was with difficulty they were pull'd afunder. But they were furnish'd with no sanguiferous vessels, nor did the included humour coagulate with the fire; whereas the ova, that is, the vesicles of the ovaries, consisting of a double membrane, not only have manifest sanguiferous vessels, but their included humour will coagulate with heat, and resembles the white of an egg in its taste, as was even observ'd in this very woman. Finally, the entrance of both the Falloppian tubes into the uterus was entirely shut up.

The thorax being open'd, the lungs, indeed, were found to be quite free from the pleura all round, but hard; so that if the proper signs of a peripneumony had preceded, they might seem to have labour'd under an inflammation. There was water in each cavity of the thorax, in so great a quantity, that a portion of it burst forth on cutting through the sternum. And the same kind of water was contain'd in the pericardium, to the quantity of about five ounces: but with this difference, however, that part of the fluid in the thorax, and part of that in the pericardium, being expos'd to the fire, the latter did not coagulate, though the former did. There was a polypous concretion in both the ventricles of the heart; but that in the right was largest, which not only was produc'd through the orifices of the vessels, but was, particularly, much enlarg'd in the auricle.

3. Whether the vesicles contain'd in the uterus were ovula of the ovaries, is not a question to be disputed of here; and still less, whether that uniform'd mass was the beginning of conception, when both the tubes were entirely shut up. The water is what I principally attend to in this, and the following observations, inasmuch as it press'd all round upon the lungs, and for that reason resisted their easy and natural dilatation; though I shall not neglect hereafter, on a proper occasion, other circumstances which relate to the same subject.

4. A woman, about twenty-six years of age, who had been more than once pregnant, swell'd in her whole body slightly, but much more in the abdomen, after great uneasiness of mind. She also breath'd with great difficulty, and with her neck erect, lay down on either side laboriously, and felt a great weight in her thorax; she thirsted greatly; till at length, her difficulty of respiration growing more violent, she died. In the abdomen there was a little water; but the stomach being very turgid, and the liver large, had driv'n the diaphragm so far upwards, that the cavity of the thorax was much lessen'd thereby. However, the lymphæducts in the belly were turgid, and all the viscera of that cavity were found, and natural, except the ovaries, which were indurated. The thorax was entirely full of water; the lungs were something red, in some measure hard, and distinguish'd with black spots, but in other respects found. The right ventricle of the heart contain'd a polypous concretion, and about this concretion was grumous blood; yet the blood in the left ventricle, and in all the vessels, was fluid.

5. As to what Valsalva left written, in the same manner as I have translated, that she who breath'd with great difficulty, and with her neck erect, lay down on neither side laboriously; he either omitted there a negative, as sometimes happens through haste and carelessness, by which we should understand, that the patient could lie down on neither side without great difficulty

faculty and pain; or we must understand him in this manner, as if he would have said, that had not the difficulty of breathing forbidden her, she could have lain down on either side for a little while, as perhaps the physicians, for experiment's sake, had order'd her to do, inasmuch as she was not prevented on one side, or on the other, by any particular anxiety or pressure, the thorax being equally full on both sides. And as to his mentioning in this, and in some other observations of this kind, that the lymphæducts were turgid, I must suppose that this happen'd, either by reason of the serum being redundant in the blood, or from the compression of those ducts, or the obstructions thereof, in the most remote parts, which are sometimes so great, that the thin coats of some of them burst asunder, and the water overflows the cavities of the body. You have in the Sepulchretum (a), the case of a young man describ'd to you, who gave himself up to the care of Willis and Lower. This young man, after immoderate riding on horseback, and other long-continu'd exercises of the body, having had such a sensation, for some time, in the left part of his thorax, that could not have happen'd without an internal compression, at length felt that some kind of vessel was ruptur'd in the same place where he felt this compression: "and from thence, for "the space of half an hour, in that part of the thorax, not only a dropping "of a fluid was perceiv'd by himself, as if it fell from the top of the tho- "rax to the bottom, but even could be heard by those who were near him," which is a circumstance not very easy to be explain'd by those who deny, that any space lies vacant between the lungs and the parietes of the thorax; though it was at the same time certainly true, as was afterwards prov'd, not only by the fluctuation of water collected in that side, perceiv'd by himself and by others, "very evidently," during the agitation of the body, but also by the drawing off of the water by the means of a pipe, first, which was introduc'd by the hands of the surgeon, and ever afterwards by the means of a foramen, that was open'd by nature, and kept open by art.

6. A man who was near forty years of age, had labour'd under a slow fever for many weeks. To this was join'd a tumour of the feet, a dry cough, and dryness of the fauces. He breath'd very short and quick, and with his neck erect: his pulse was scarcely perceptible. He died suddenly. While the integuments of the abdomen were separated from the muscles beneath by the scalpel, a watry humour issu'd out from the left part of the umbilical region. Yet every thing was found in the belly, except the spleen, which was three times bigger than it is naturally. In both cavities of the thorax a limpid serum stagnated; which being preserv'd in a glass vessel, threw down a kind of sediment, but in separate portions, and quite to the bottom of the glass, yet shew'd nothing of the appearance that serum found in the thorax generally does; I mean, a kind of condens'd cloud swimming in the fluid. The lungs were found, and altogether free and unconnected, unless that the inferior lobule of the left lobe was tied to the pleura, by a short and slender connexion. The pericardium was dilated, and contain'd more than half a pint of limpid serum. The heart was enlarg'd, and in the right ventricle, particularly, was a lax polypous concretion; which certainly is a cir-

(a) l. 2.S. 1. Schol. ad obs. 75.

cumstance very rare in the heart of those who have water stagnating in their cavities. The thoracic duct, and the lymphæducts also in the belly, were so far become empty, that not the least vestige of them appear'd in any part.

7. Here also, when Valsalva speaks of the polypous concretion in the heart, he may perhaps seem to have omitted a negative particle by accident, and to have meant to say, that it was a circumstance not very rare, since, out of these nine observations on the hydrops thoracis, there are no more than two, in which he has remark'd it to be wanting.

But as to his observing the lymphæducts to be empty in this body, perhaps by this another cause is hinted at, which had produc'd the dropsy in this man, different from what had produc'd it in the woman last spoken of. Perhaps you will ask me whether this cause was the rupture of those ducts. For you are induc'd to suspect this from their emptiness, and from the effusion of a limpid humour, which had but little sediment, and also by the observation of the younger Du Verney (*b*), on patients labouring under an ascites, from whom, if the surgeon does not draw off a fluid much unlike this, the belly begins to swell again in a short time, and scarcely any hope of life remains. But whether these things necessarily, or only probably, indicate a rupture of those ducts, I think, can hardly be determin'd with safety, in any case: for in this, if the emptiness of these ducts were a proof of their rupture, it would also prove, that wherever they are observ'd to be empty, the belly there must have been hydropic. However, the dropsy of the pericardium, join'd with this dropsy of the thorax, besides the enlarg'd capacity of the heart, as in the woman who had been lately married (*c*), and the hardness of the lungs in the same, from which the second was not entirely free (*d*), and whose diaphragm, besides, was so greatly forc'd up by the viscera that lay under it into the cavity of the thorax; all these circumstances, I say, will probably make an observation more agreeable to us, wherein nothing at all is set forth that could be injurious to respiration, but the dropsy of the thorax, whereof we principally treat; and of this kind will the observation be which I immediately subjoin.

8. An old woman of seventy had a difficulty of breathing, and could lie only on her back: she had a slight cough, spat up a catarrhus matter, and was very thirsty: her pulse was sometimes scarcely perceptible: the right foot had an œdematous swelling upon it. Before she died, she threw up by vomiting, for a quarter of an hour together, a fluid of an æruginous colour. Her abdomen being open'd, the colon was found to infect itself downwards, quite to the pubes, from the arch of it that lies under the stomach, and from the pubes to be reflected upwards again, till it return'd to its usual seat. The stomach contain'd a liquor, of the same kind with that which had been thrown up by vomiting; and in this liquor swam a concrement of the same colour. A portion of this fluid being set by, shew'd a kind of matter precipitated to the bottom on the day following. But two other portions having two different fluids mix'd with them, the one spirit of vitriol, and the other spirit of salt ammoniac, as they are call'd, shew'd at

(*b*) Mem. de l'Acad. R. des Sc. A. 1703.

(*c*) n. 2.

(*d*) n. 4.

that time no change indeed; soon after, however, the first had a kind of sediment in the bottom, and the second none. In each cavity of the thorax serum stagnated to the quantity of three pints. Each lobe of the lungs was connected anteriorly to the pleura. In the right ventricle of the heart there was a small polypous concretion, which was also produc'd through the orifices of the vessels.

9. If you set aside the consideration of the matter thrown up by vomiting, inasmuch as it belongs to another place, the situation of the colon, which is less frequent indeed, but not very rare, and the connection of the lungs, and the polypous concretion, which are both of them very innocent here, as I think ought to be observ'd, and are beyond doubt to be frequently met with, in those who have had no difficulty of respiration; the water, which was extravasated in the cavity of the thorax, will then remain, and be the only cause to which you can attribute the laborious breathing. And as you observe this symptom, and the swelling of the feet, the thirst, and the dryness of the fauces, in the three former histories also; and in two of them a lowness of the pulse, with a dry, or almost a dry cough, which may be compar'd with this, that discharg'd nothing at last but a catarrhus matter; you may, I think, now suspect what symptoms might relate to the dropsy of the thorax, in those three also, and what to other disorders that were conjoin'd therewith. Which other disorders, however, might in particular increase the difficulty of respiration so much, as to bring it to a perfect orthopnoea. And for this reason you will not wonder, that the old woman could lie on her back; and as to her not being able to lie on either side, this was owing to the water, which was equally collected in both cavities, but not so as to fill either. And that you may the better understand this, and some other things which I have here hinted at, attend to the histories that follow, and compare them with this and the former histories.

10. A young woman having been long troubl'd with a cough, thirst, and difficulty of breathing, was particularly oppress'd thereby, in the nights of the last days of her life. When she cough'd, she sometimes brought up a catarrhus matter: she could not lie down on her left side, by reason of the tightness of the præcordia; for which reason she lay on her right. Her feet were turgid with an cedematous tumour, her face and her belly were also swell'd, but the latter slightly only. About three days before death she was in a manner lethargic, and had a hesitation in her speech; and the last two days her pulse was entirely imperceptible.

In the abdomen serum was effus'd to the quantity of three or four pints. The liver was palish, and the spleen small; but in other respects both of them found. Scarcely any traces of the lymphatic vessels appear'd in the abdomen. In both the cavities of the thorax the lungs were found; in the left loose and free, but in the right closely adhering to the pleura: again, in the left, was a small quantity of serum; but in the right, whatever space was left vacant between the pleura and the lungs, was fill'd up with a yellow serum. In the ventricles of the heart, was a fluid blood, without any sign of a polypous concretion. Finally, in the head was a sound brain, except that the lateral ventricles contain'd some serum, and that slightly ting'd with blood. This serum being put upon the fire, threw down a thick matter to the

the bottom of the vessel, and itself all evaporated into the air. And as to the serum which I said was in the abdomen, and in like manner, in the right cavity of the thorax, that was first made turbid from the fire, then by degrees evaporated, but especially what had been contain'd in the thorax, for it left nothing behind it but a somewhat glutinous pellicle; the same was also left by the other, but together with some remaining fluid.

11. Omitting what relates to the soporific disorder, which I have treated of elsewhere, and the cause of which, in this case, you see was serum also, that had been lately extravasated in the brain (nor is it to be wonder'd in such a body); and even omitting what belongs to the other symptoms, which you may easily compare with the preceding, and find to be the same; I will not omit two things, which relate to the difficult respiration: one, that the woman could not lie on the left side, inasmuch as she carried on respiration chiefly with that lobe of the lungs, in consequence of the right side being quite full of water; wherefore, if the water of the right side, lying upon the mediastinum, press'd it in upon the left cavity of the thorax, which was already, of itself, not altogether free from serum, and at other times always less than the right, she would naturally be troubl'd with a tightness of the præcordia by reason of respiration being more impeded: and the other is, that her respiration was, particularly, more difficult in the night. But if this were really the pathognomonic symptom, as we commonly speak, of the dropy in the thorax, you ought to wonder, that in so many other observations of Valisava's, and of mine, it was wanting, rather than that it is mention'd here. Yet you will see many physicians collectedly mention'd by the celebrated Reimannus (*e*), and those excellent physicians too, who have asserted this doctrine. But the first of them was Carolus Piso, as the Sepulchretum itself (*f*) will shew, and others have confirm'd it by their observations since his time, as related in the same place (*g*). Nor, indeed, can it be denied, if to other symptoms this is added, that a more increas'd difficulty of breathing awakes the patient suddenly from his first sleep, it is often a true conjecture, that the patient labours under a dropy of the thorax, either because the blood, being rarefied by the heat of the bed, does not find sufficient room to pass through the lungs that are compress'd by the water, as Willis (*b*) has hinted, or rather from some other cause; for it is not water alone that can compress the lungs, or contract the sanguiferous vessels that pass through them: although it is probable, if you take the cases in general, that Willis had well explain'd the subject, as Reimannus, whom I spoke in commendation of above, has observ'd, that nearly the same thing happens in other diseases (*i*): in which diseases, I observe, that the lungs may be press'd upon, and the passages of the blood through them constrict'd; so that this fluid being rarefied from the warmth of the bed, in the same manner as from the exercise of the body, it is not able to find its passage through the lungs, especially in that situation of body. But if the pressing or constricting cause, or if the streighten'd passages of the blood, or, finally,

(*e*) Ast. N. C. Tom. 1. Obs. 170.

(*f*) L. 2. S. 1. Schol. ad Obs. 137.

(*g*) Ead. S. Obs. 81, 82.

(*b*) Ibid. Schol. ad Obs. 76.

(*i*) Obs. 170. cit.

if the blood that is about to pass through them; I say, if all these circumstances, or the greatest part of them, are not dispos'd in such a manner as to have those consequences, the patient will not only not be rous'd, in the first hours of his sleep, by the instant danger of suffocation in those disorders merely, but not even in the dropsy of the thorax. Wherefore, you perceive, that the celebrated Helwick (*k*) has rightly admonish'd us, how far it by no means follow'd, that the patient did not labour under a dropsy of the thorax, because he was not thus rous'd. And, indeed, to the observations which he points out, others may be added, and especially of a young and noble lady (*l*), whose "sleep was very long, and continu'd till late in the morning;" and of a Polish senator (*m*), who "had no interruption of his sleep, with a danger of suffocation;" and yet a large quantity of water was found in the thorax of each of them.

You perceive also, as the same Helwichius did not doubt, on the other hand (*n*), that those who had this interruption did really labour under a dropsy of the thorax; you perceive, I say, that he seems to have ascrib'd more than is just to a great number of observations, as I hinted above, which he also confirms by his own, made on a certain matron, and one likewise made on a matron by others; and you may also confirm by still other observations, and by those in particular which were made by the uncle of our Valisneri (*o*) on a dyer, and by the illustrious Buchnerus (*p*) on a certain man: but these, such as, though they are true, do not prevent those which Reimannus has oppos'd to them from being equally true, and especially the observation which carried that most experienc'd physician, Jo. Jacob. Vicarius (*q*) so far, that from this symptom, in particular, he believ'd he could "swear, that the patient infallibly labour'd under a dropsy of the thorax;" yet in the thorax of this very patient, when open'd after death, "did he find not the least drachm of serum, or water," either in the left, or the right cavity; upon which he cried out, with an ingenuoufness never sufficiently to be commended, and full of wonder, "Oh how fallacious sometimes are diagnostics!" It does not however escape me, what exception he afterwards thought of, to wit, that this symptom was not to be depended upon, unless the feet swell'd after it, and not before it; nor how ingeniously others have studied to invalidate this observation, and others that have been objected to them, by Reimannus. But I neither see that this exception is at all a natural consequence, nor is it my intention, nor is there any necessity, to make the controversies of other persons mine, by examining that exception, or others, and others after that, since the very number of these exceptions sufficiently shews, how often, and how easily, the symptom we speak of, or if you would rather have it so, the similitude of that symptom, can deceive even the best physicians; so that they think in diseases of the lungs, heart, aorta, and pericardium, and in spasmodic suffocations, which I have more than once seen return exactly at the same hour, and not only within

(*k*) Eph. N. C. Cent. 10. obs. 32.

(*l*) Sepulchr. l. 2. S. 2. obs. 3. in Schol.

(*m*) Commenc. Litter. A. 1733. Hebd. 11.

n. 2.

(*n*) cit. obs. 32.

(*o*) Eph. N. C. Cent. 8. obs. 74.

(*p*) Eorund. Act. Tom. 6. obs. 50.

(*q*) Eorund. Cent. 1. obs. 3. in Schol.

the pretty long space of one, two, or three hours, after the first sleep, that they are not these disorders in reality, but that there is water in one, or in both the cavities of the thorax. Wherefore, neither this symptom will be of itself, and without frequent hesitation, the most characteristic mark of the disease, since it sometimes appears in others also, and since it is even not very seldom wanting in those, who have appear'd after death to have labour'd under this disease, as the observations of Valsalva, and mine, testify. However, it is not to be despis'd, if it be join'd, as I said, to other signs, by which it is generally most evidently indicated that water is collected in the cavity of the thorax.

12. A woman, of seventy years of age, of a sanguineous temperament, and fat, while she was constantly attending upon her son, who had a pleuritic fever, being seiz'd with a pleurisy herself, got rid of it after many days, without any expectoration of matter. But a sense of great oppression, in the left part of the thorax, immediately succeeded to the pleurisy; so that she could not breathe in bed, unless she lay on her right side. She spat up a catarrhus matter, was extremely thirsty, and had a swelling in her lower limbs. To these disorders, about four months after, was added a violent diarrhea, which was troublesome to her, frequently, every day, and lasted for three months. In all this space of time, a fever return'd at a certain period, with cold, heat, and pain of the head. All these symptoms continuing, she died at the end of the seventh month from the beginning of the disorder.

The belly being open'd, the liver was of a somewhat cineritious colour, but in other respects found. The remaining viscera were also found, except that, in the pancreas, an artery was found to have acquir'd a bony hardness, in the beginning of which even concreted blood itself was contain'd, and after that the fibrous substance of the blood only condens'd. In the right cavity of the thorax was no disorder at all: but the left was full of water, in which some kind of filaments, as it were, swam. Yet the lungs in that water were unhurt, only a little flaccid. In the right ventricle of the heart was a large polypous concretion, which extended itself from thence into the vena cava.

13. That an empyema did not succeed to the pleurisy, not only other things shew you, but the great quantity of water, with filaments of that kind, which are us'd to be found in the thorax, after great inflammations of this cavity, when I shall treat of those inflammations, will confirm. And that the fibrous substance of the blood, confin'd in any artery, as it was in that bony one, would be so condens'd, as at length to shut up the passage of the blood, which follows from behind, is what was taught in former years, by the celebrated surgeon Petit (r). But why the woman did not lie on that side which was full of water; contrary to what happen'd in the woman I spoke of a little before (s), and contrary to what generally happens, may perhaps be accounted for, from the mediastinum being here more able to resist the weight of incumbent water, or at least from the opposite side being able, as it was entirely free from serum, to bear the diminution of its cavity,

(r) Mem. de l'Acad. R. des Sc. a. 1731.

(s) N. 10.

that was made by the incumbent water; which could not be endur'd in the former woman, inasmuch as the opposite cavity was itself, in some measure, taken up by water of its own.

14. A woman of fifty years of age, of a thin habit, and a pale colour, having labour'd under a dyspnoea, for a year, and the disorder encreasing upon her, was receiv'd, at length, into the hospital of St. Mary de Vita, at Bologna. Her respiration was extremely laborious, her thirst great, her pulse moderately quick and small; which faulting more and more every day, she died. The viscera of the belly were all extremely natural and sound. In the left cavity of the thorax also the lungs were found, and every where free from the ribs; but swam in a pint and half of saltish water. And the right lobe of the lungs adher'd so closely to the pleura, as to be one continu'd body with it: wherefore, no water was seen on that side; except that a little serum flow'd out from the lower part of the lungs, when lacerated, by dividing it with the knife from the pleura. In the heart were three polypous concretions, resembling condens'd mucus, both in colour and consistence; and in the veins was found a thick and viscid blood.

15. What shall we say was the cause, why so little serum, if you compare it with the former histories, and that in one cavity of the thorax only, should render the respiration so extremely laborious? Was it because the serum, being impregnated with saline particles, did not so much press upon the lungs by its quantity, as it constring'd by irritating them, now and then, with a kind of spiculæ, as it were? You know, that Albertini (†) taught this doctrine in dependance upon his own observations, and explain'd, by the irritation of salts of this kind, a difficult respiration from extravasated serum, “not in great quantity, but turbid, and intensely yellow.” Such as this, indeed, is not describ'd in the present history; but it is said to be “saltish,” which was not observ'd in any of the others.

Perhaps you expect I should here add that very close cohesion between one lobe of the lungs and the pleura, to assist in accounting for the difficult respiration. But how great controversies there are about the noxiousness, or innocence, of this kind of cohesion, you may even know from looking into the Sepulchretum. For Hippocrates, or, if you please, the author of the second book *De morbis* (u), call'd it, as interpreted by Salius, “a prolapsus of the lungs in the side,” and from thence accounted for difficult respiration. Nor did he suppose it to be owing to a wound only, inflicted by the surgeon, in order to extract pus; but it is said to arise from an internal cause also, both there, and in the book *De locis*, where it is expressly written, that the lungs, being dried, “adhere” to the moist pleura, and make a dry pleurisy: which Boerhaave (x) taught nearly in the same manner, though in some measure inverted, when he says, where “the seat of the pleurisy was, “there the pleura was render'd imperforable, and adher'd to the lungs of “the same side.” Moreover, others have follow'd Hippocrates, explaining this adhesion, indeed, in a different way, that is, from “a viscid” serum

(†) Comment. de Bonon. Sc. Inf. Tom. 1. in Opusc.

(u) Vid Sepulchr. l. 2. S. 1. in Schol. ad Obs. 67.

(x) Prelect. ad Instit. § 606.

“transfuding” from the diseas’d lungs, “and, by reason of respiration “being impeded, acting the part of a gluten in the chest, from rest and “compression (y);” or “when the lungs grow out into a great bulk, by “reason of a catarrhus matter being imbib’d, and are thus scarcely mov’d (z):” but, nevertheless, accounting for the difficulty of respiration, with which they were troubl’d, when living, from this cohesion found in their bodies after death. On the contrary, others deny, that this disorder can be accounted for from thence, and produce not only their own observations, but those of their adversaries; since the same person, who had just said, that he found the cause of an asthma, of many years continuance, to be an extensive adhesion of the lungs to the ribs (a), immediately confesses, “that the lungs were connected in the same manner” in a man, who “had been nevertheless an excellent runner, and, therefore, that an adhesion of this kind did not of “necessity bring on an asthma.” And similar to this, are so many observations, both of others, and of mine, that I think there is no occasion to give many instances of what is commonly known. And, indeed, the lungs are found to be sometimes connected, not only all round to the ribs very closely, but also to the diaphragm, and mediastinum, without any previous difficulty of breathing; as the observation in the additamenta to the Sepulchretum (b), which is Diemerbroeck’s (c), and under number twenty-four, will shew. And less large cohesions, such as instances are produc’d of, in the same observation, have occur’d so often, and in so great a number, to former anatomists, that some of them have thought they were agreeable to the intentions of nature, and useful to man (d).

16. In this so great diffension of very great men, it is not an easy matter to reconcile their opinions. For what you see advanc’d by some, that a lax and rare adhesion is not injurious to respiration (e), but that it is injurious, if it be very close, and on all sides, or extended to great tracts; this, in fact, by no means answers to the observations that were a little before pointed out. Nor because to the argument of those who deny, that they are injurious to respiration, because the lungs certainly must “in inspiration” follow “the “motion of the dilated chest, and be streighten’d in expiration in proportion “thereto (f),” another kind of argument is objected by a great man, “that, “in an extensive adhesion of the lungs to the pleura, the lungs cannot descend, and follow the diaphragm, when the chest is dilated,” can any one from hence bring about a reconciliation, by affirming that respiration is hurt only from the adhesion of the lungs to the ribs, but not from the adhesion of them to the ribs and diaphragm at the same time. I say, can the dispute be thus compromis’d? Certainly, by no means. For, to omit other things, you have seen, in one of the observations which have been mention’d, that there was a cohesion with the ribs only, and yet respiration was unhurt: to which you will find many observations similar, and in particular two of the celebrated Hahnus (g), and that, in like manner, which was made formerly

(y) Sepulchr. S. cit. Schol. ad Obf. 63.

(z) Sect. ead. Obf. 64. § 9.

(a) Ibid. § 8.

(b) Sect. cit.

(c) Anat. l. 2. c. non 12, sed 13.

(d) Vid. Schol. ad illam Obf. 24. & ad super. Obf. 64. § ult. & ad 65.

(e) In iisd. Schol.

(f) Vid. Schol. 3. ad Obf. 32. in Addit.

(g) Aët. N. C. Tom. 7. Obf. 13.

by Piccolhominus (*b*), on an acquaintance of his, “ of the whole lobe of “ the lungs very tenaciously adhering to the ribs all round, although in him “ there had been no difficulty of respiration.”

How is it then? I certainly cannot deny what I, for the most part, find, promiscuously, in the dissections both of men and women, by whatsoever disease they have been taken off, and what every-body sees almost every year, when I demonstrate the viscera in their natural situations, in the theatre; I mean, that the lungs are more or less connected to the parietes of the thorax: so that, as Diemerbroeck (*i*) has asserted, it was common “ almost to the third part of mankind,” and Tulpus (*k*), “ that the lungs were quite free “ in few bodies,” I confess, that my observations come nearer to those of the latter, than of the former, when taken all together. Shall we then say, that few men have a freedom of respiration? I, perhaps, shall not even say that which some have said, that few have a very easy respiration, when they have acknowledg’d, that this adhesion is, almost perpetually, found in adults. And yet I am not, for that reason, on the side of the question with those, who have suppos’d it to be a natural connexion; as I well remember, that out of so many foetusses which I have dissected, I have not observ’d in more than one a connexion of that kind (although Diemerbroeck (*l*) does not seem to have believ’d, that “ any one was born with it ”); nor am less conscious, that it is so rarely found in animals who come near to us in their structure, that if at any time a somewhat large adhesion occurs, they “ are suspected of “ disease.” But as it is not from nature, so neither is it scarcely ever but from disease, as the same Diemerbroeck thought, for instance, “ from the “ pleurisy, the peripneumony, or any other similar disorder, attended with “ ulceration.” Nor is it credible, and I even know it to be frequently not true, that, if you except a few, all other men have been troubl’d with disorders of this kind: but it is a much more probable conjecture, which I remember the celebrated Vernouius formerly wrote to me, that this appearance being common to men alone, and almost to all men, but not to their foetusses, arises, perhaps, from the action of laughing, which is common to them alone, after they are born. But from what cause soever that is, which, (setting aside those, in whom it cannot be denied but it may have happen’d from disease) I say, from whatsoever cause that is in others, which, it is certain, generally does happen, though it is uncertain in what part chiefly, and how extensively it may happen, as our Columbus has rightly admonish’d from hence (*m*), that a man “ may labour under a wound penetrating into the thorax, nor yet the “ wound be seen to breathe;” so, for this very reason, those surgeons act prudently, who perform the perforation of the pleura with the finger rather than with the knife.

But to return at length to that which you expect: When the foregoing injury of respiration is accounted for from the adhesion found in the lungs, I have a vehement suspicion, either that some cause, out of so many which can really injure it, was not properly attended to; or, if there was, in fact, no

(*b*) L. 4. Anat. Præl. Lect. 8.

(*i*) Obf. 24. cit. in fin. n. 15.

(*k*) Vid. Schol. ad Obf. 65. cit. ad eund. n. 15.

(*l*) Vid. Schol. ad cit. Obf. 24.

(*m*) Vid. Schol. ad § 9. Obf. 64. cit. ad n.

other cause any where to be found, that it might have lain hid in that very surface of the lungs, which was connected to the pleura: let us suppose, for instance, some crisperature that resists the speedy transit of the humours, so that the nerves may be thence irritated, and disturb the internal offices of the lungs: which, if you consider the different nature of the humours, and disposition of the nerves, in different persons; will, perhaps, not altogether displease you, or will stir you up to think of some other reasons, which may be more satisfactory to you, and of consequence to me.

17. A virgin of fifteen years of age, was troubl'd with an acute fever, and, particularly, with a dreadful pain of her head; for all her other symptoms were mild. About the tenth day the fever seem'd to remit. But after a few days, a great thirst, a laborious respiration, and a pain in the left part of the thorax, were added to the fever. The two last-mention'd symptoms growing more violent within a few days, being perfectly in her senses, and having the free use of her speech, she died, contrary to the expectation of those who were about her. The thorax being open'd, the lungs were indeed found; but the left cavity of the thorax was found to be full of serum, not much unlike the urine of horses, in which some concretions swam, that resembled the white of an egg. In the right cavity also was serum, though in very little quantity. But in the pericardium was such a quantity, that it fill'd the whole cavity, and was more thick, than that which had been seen in the thorax: and as the external surface of the heart was slightly eroded, it might perhaps be conjectur'd, that this had happen'd from the same serum. The polypous concretions in the ventricles of the heart, in some measure resembled a condens'd mucus: but that was the greatest which was in the left ventricle.

18. That a fever of this kind seem'd to remit, without any excretion of the matter, which had given rise to it, was violently to be suspected; and indeed this had pour'd itself out into the cavities of the thorax and pericardium, endow'd with that acrimony which a dreadful pain of the head first, and after that of the left part of the thorax, had indicated, and the erosion of the heart had confirm'd. But as this cause of the fever had been diverted from the head to the thorax and the heart, it is not to be wonder'd at if the tongue and the senses were free, and their use perfect to the last, and if death came on sooner than it generally does in a dropsy, and sooner than the persons who were about the patient expected it; although dropsies "arising after acute disorders," as we have it in the *Prænotiones* (n), "are all bad." For they do not free the patient from the fever, and are very painful and "mortal." But as to those concretions in the extravasated serum, which Valsalva liken'd to the white of an egg; this must be understood of the white of an egg condens'd, and harden'd in warm water, as he declares in another observation (o). Last of all, as to what relates to the dropsy of the pericardium, mention'd above also in some histories, we will consider it presently by itself, when I shall have given the history of the disease and dissection of another virgin.

(n) n. 8.

(o) Epist. 20. n. 36.

19. A virgin, about two-and-twenty years of age, was not able to breathe, unless with her neck erect; she had a great thirst, and a considerable cough, and threw up a kind of purulent matter from the lungs, which was sometimes also ting'd with blood; she had a fever, her face was swell'd, and at length she died. In the belly some pints of water stagnated; yet all the viscera of that cavity were uninjur'd. The right cavity of the thorax was full of serum; of which there was also a less quantity in the left. The substance of the lungs discover'd not the least injury; only in some places it was a little red, and in others white. The whole pericardium was fill'd with water. In the ventricle of the heart was nothing but a fluid blood.

20. I have already said enough upon the dropfy of the thorax, and the greatest part of its symptoms, as far as the observations of Valsalva relate thereto; so that I think there is less occasion to enlarge upon these heads now, as there was also under the former observation, especially as other difficulties, beside this disorder itself, were join'd with it: although in this virgin, the matter spit up does not seem to have been really purulent; and that it was sometimes ting'd with blood, it is easy to suppose was the accidental effect of the violence in coughing. Let me rather add something, as I have more than once promis'd, upon the dropfy of the pericardium.

Freind (*p*), amongst those things which are proper and peculiar to Avenzoar, places this that he speaks of that dropfy, and nevertheless adds, that he had never seen it, "and that Galen himself does not say one word upon "the subject." But it is natural to understand what he says, in such a manner, as if Galen had never seen it in the human subject; since nothing was more commonly known among his followers, than what he said in the fifth book, *de locis affectis* (*q*): "to wit, that a palpitation of the heart either "happens by itself, or with some indication that the heart is mov'd in a "fluid: nor ought it to seem wonderful, that so great a quantity of water is "accumulated, sometimes, in the coat surrounding the heart, so as to prevent the heart from being dilated;" and as he had seen, as he goes on to say, a great quantity of fluid there, in dissected animals, and an hydatid in an ape, and a schirrhous tumour in a cock; "from whence," he concludes, "a probable conjecture may be drawn, that men are troubl'd, also, with "similar disorders." It is evident, therefore, that Galen was not only not entirely silent upon this disorder, but that he even very sagaciously conjectur'd it; and more than this, seems indeed to me to have pointed out some mark to distinguish it, and some manner in which it may arise; I mean, from hydatids being ruptur'd within the pericardium, as I shall hereafter shew (*r*). But if you cannot use equal candour with a modern physician, in other respects learned, who let this sentence I know not how escape him, that the dropfy of the pericardium "was to be sought for rather among the inventions of artists, than in the works of nature;" yet you will at least agree with another great man, whom I have commended above, who only pronounc'd, that "the dropfy of the pericardium was a very rare disorder." For by this I shall suppose, that he meant to say it was a very rare disorder by itself; not when join'd with other disorders of the thorax. For I my-

self, as well as many others, have frequently seen it join'd with these disorders; but, as far as I remember, never alone. Wherefore it is very difficult to determine upon the peculiar symptoms of it; and observations made upon this disorder alone, if it be at any time found to be solitary, ought to be very diligently attended to, as the following one from Valsalva.

21. A certain man, whose feet had been affected for some time, with an œdematous tumour, was seiz'd with a slight fever: his respiration became difficult, and more difficult every day, so that he was forc'd to breathe with his neck strait; he cough'd, and spat up a catarrhus matter with it; he had also a great thirst. At length he died. The body being dissected, the pericardium was found to be full of water.

22. I know you very much wonder now, that you read of no symptom in the dropy of the pericardium alone, which you did not read above in the same, join'd with a dropy of the thorax, and even in the dropy of the thorax, disjoin'd from that of the pericardium. For which reason you will the more readily believe, that Grætzius wrote the truth, in the disputation (s) which he publish'd under the patronage of Hoffman, when he expressly asserted, "that he could find scarcely any signs, by which even the most experienced physician could rightly distinguish these two dropies, one from another." Yet he immediately subjoins, "Unless any one should perhaps say, that the faintings were more frequent in the dropy of the pericardium, than that of the thorax, and the difficulty of breathing more mild; and besides, that the patient affected with a dropy of the pericardium, does not feel the fluctuation of the water so distinctly, in turning himself from side to side, as he has observ'd they are accusom'd to do, who labour under a dropy of the thorax." Yet in the beginnings of the dropy of the pericardium, "they are wont," says he, "to be troubl'd with a puitous or scorbutic cachexy, attended with a complexion of a lead-colour, with a pale and viscid urine, with various obstructions of the viscera, with a languor of all the bodily functions, and a decrease of the strength:" and as the disorder encreases, "the pulse grows extremely small, the urine is pale, thin, and in little quantity, there are sometimes frequent faintings, and a weight is felt oppressing and constringing the heart, respiration becomes rather more difficult, a slow fever, with thirst, frequently comes on," and other "cruel symptoms," which he omits; so that the disease beginning, in a manner, by stealth, and "gradually and successively attacking" the patient, breaks out, at length, into that "violent severity of symptoms," which I have mention'd. All which things I have related, that you may compare them, not only with the histories that I have produc'd, or am to produce, but also with those that are describ'd by others, and even with that (t) which afforded an occasion to Grætzius himself, of writing this disputation. Although the pericardium had been so extended, from water of such a kind, as to corrode the external surface of the heart universally; so extended, I say, that, as his own words are, "it fill'd the whole cavity of the thorax," and the cavity of the thorax was, for that reason, free from any extravasations of serum; yet we only read in regard to the symp-

(s) de Hydr. Pericard. § 4.

(t) in Proœmio, & § 3. ejus Disput.

toms, that the patient “felt an oppressive weight in the lower part of the “ chest, and being long troubl’d with other symptoms, that generally indicated a dropsy of the thorax,” at length died, as if suffocated “by a dropsy “ of the thorax, as had been suppos’d.” But if you leave that observation, and go to the Sepulchretum, in which there are many more histories described, whether you turn to them, in which other disorders also, and in particular a similar corrosion of the heart, with a very considerable dropsy of the pericardium is propos’d, as the eighty-sixth of the first section, in this second book; you will read, that the urine was “in small quantity,” indeed, but “turbid, and the blood scorbutic;” yet omitting some things, which are evidently to be refer’d to other causes, as the pain of the left hypochondrium, “the very violent asthma” alone, will remain to be refer’d to this cause, which itself also is in part referable to another; or whether you seek for those in which nothing but the pericardium is mention’d to have been “full of water,” or “swell’d out into a vast tumour, and distended “with many pounds of water,” you will find these are all the symptoms taken notice of, “that the heart had vehemently palpitated,” or that the patient “had for a long time labour’d under a palpitation of the heart, and a “difficulty of breathing,” as in the articles ten and four of the twenty-first observation of the eighth section; into which section, as it relates to the palpitation of the heart, even more histories of this dropsy are transferr’d, than into that first section, which particularly treats of this disorder.

23. Since we are come to the sign pointed out by the conjecture of Galen, as I said above (*u*), which was deliver’d at the same time, on account of this disease, and on account of another, I mean these words, “with some indication that the heart is mov’d in a fluid;” we must see whether the event often answers to that conjecture. Our Saxonia, indeed, as you will see in the Sepulchretum (*x*), said, that the signs of a heart palpitating from this disorder, were a soft pulse, a quick respiration, no thirst, hollow eyes, and that the patient at the same time, particularly, “felt that the heart was “swimming, as it were, in water;” and that a noble Venetian was us’d to relate this to him, who “labour’d under a great quantity of water in the “pericardium, as the dissection demonstrated.” But Reimannus (*y*), although he knew, in like manner, from another of our professors, that the same had been felt in a certain old man, says, that there were few men of so exquisite a sense: and, indeed, we do not see, that it is mention’d in so many other, I do not say *ratiocinations* (*z*), but observations; and he shews by histories, which he introduces, that a palpitation of the heart has sometimes been wanting in this disorder. To which, lest you should think them very rare, do not forget, that those I have describ’d above, and those I shall describe hereafter, will be to be added, and others also, but, in particular, those that are transferr’d into the Sepulchretum, from Diemerbroeck (*a*); who denies, that, in any of those he dissected, there had been “any palpitation of the heart,” though they had been considerably affected with a

(*x*) p. 20.

(*y*) l. 2. S. 8. obs. 29.

(*a*) A.R. N. C. Tom. 1. obs. 170.

(*z*) ut Sepulchr. cit. S. 8. in Schol. ad obs.

21. § 4.

(*a*) Sect. ead. 8. obs. 22.

dropſy of the pericardium; and, on the other hand, afferts, that “ he had “ found the pulſes very languid and few,” and that palpitation “ was excited, “ rather, by any kind of liquor, although in little quantity, ſo that it can “ but irritate the heart with any vellicating quality.” And, indeed, Diemerbroeck has many followers among the more modern obſervers; all of whom prove this laſt aſſertion; and, moreover, ſome of them confirm the former, for this reaſon, becauſe they do not doubt, that the tone and ſtrength of the heart, and its fibres, are rather broken in upon, and diminifh’d, by being waſh’d ſo long with a great quantity of water. But there are even obſervations, not only of the heart being vellicated in this dropſy, but alſo of its being corroded, in which no mention is made of palpitation, ſuch as I have produc’d above (b); and ſuch as thoſe you will find in the third and fourth *Centuriæ Cæſareæ Academiæ* (c), that are more remarkable ſtill; and in the *Sepulchretum* itſelf (d), beſide that which is pointed out above (e): in which, if you ſuſpect that the eroſion was, perhaps, more in appearance than in reality, you muſt confeſs, at leaſt, that vellication and uneaſineſs were not wanting from the matter that was lying about the heart. And there are innumerable obſervations, which no-body is ignorant of, in which, though the pericardium was quite free from water, a palpitation of the heart had attended on other, and far different, diſorders. Which it is neceſſary to remember, whenever you read, that this ſymptom was join’d with a dropſy of the heart. And we do read this very often. For, not to make uſe of other examples, except what are extant in the volumes of the Cæſarean Academy, already commended, and could not have been related in the *Sepulchretum*; you will find that it is five times obſerv’d (f). But five times, in like manner, you will find, that at the ſame time, the aorta near the heart, or the valves of the vena cava, at the heart, were become bony, or that even the heart itſelf was much bigger than its natural ſize, and ſometimes even of a ſtupendous magnitude, or ſo loaded with fat, beſides that which it is ſcarcely ever without, that the auricles, and the whole heart itſelf, reſembl’d nothing, at firſt ſight, but one great heap of fat, or ſchirrhouſ and corrupted lungs; or finally, nor that ſeldom, a dropſy of the thorax join’d with a dropſy of the pericardium: and that a dropſy of the thorax may not only be attended with thoſe other diſorders which have been mention’d, but may even ſometimes have a palpitation of the heart join’d with it, is certain from other obſervations, to which you may alſo add that which is in the ſame volumes (g). But there are, you will ſay, examples likewiſe, from whence it appears, that palpitations have proceeded from the dropſy of the pericardium; nor are they even wanting in the *Sepulchretum*, in which thoſe are mention’d as being join’d with this one diſeaſe alone, as is acknowledg’d above (h): and that moſt judicious phyſician, Boerhaave, who certainly wrote after theſe controverſies (i), has expreſsly affirm’d, “ that from a dropſy of the pericardium,

(b) N. 17.

(c) Obſ. 141.

(d) L. 2. S. 2. Obſ. 3. cum Schol.

(e) N. 22.

(f) Dec. 3. A. 5. Obſ. 154. Cent. 6. Obſ. 51. Aſt. Tom. 1. Obſ. 170. Tom. 2. Obſ. 7. Tom. 6. Obſ. 143.

(g) Tomo eod. 6. Obſ. 50.

(h) N. 22. (i) Prælect. ad Inſtit. § 711.

"wonderful palpitations of the heart are brought on." How is it then? We must suppose that the observations of all these gentlemen are true, but that they were made upon patients of different temperatures, and at different times of the disease: wherefore, although this symptom is not, indeed, to be consider'd as inseparable from, and proper to, the disease, yet it is by no means to be slighted; and so much the less, as it has been more frequently join'd with other disorders, that have often been observ'd to attend upon this dropfy.

24. But in what manner, to return thither again, shall we distinguish this from the dropfy of the thorax? You have seen what Grætzius has pointed out (*k*); now take what Reimannus points out (*l*). "There is here also," says he, "a difficulty of respiration, especially after stronger motion, or from the ascent of steep places, with this difference, however, that the oppression of respiration is attended with anxiety, rather than with any thing sonorous; frequent faintings also attend a dry small cough, and rather more than in the dropfy of the chest, a slow wasting of the body, without any manifest cause:" and this Carolus Piso also laid down for granted, and some other things, which he explains by reasons that he brings, as you will see in the Sepulchretum (*m*). But if you require observations rather than authorities and reasonings, you will not find any in Reimannus, that relate to the disorder whereof we treat, when it is disjoin'd from others, as it were to be wish'd they had been. Yet there were some already publish'd many years before, which might be produc'd from Vieussens, and one long before that time, made by Stalpart (*n*). For he tells us of a girl being cur'd by him, who had her face pallid, and very much swell'd, and had never undergone any menstrual purgations, in whom "he could very distinctly hear the agitation of the water itself in the pericardium, when the heart was pulsating (for she labour'd under a palpitation of the heart)." And Galen, indeed, as we have seen above (*o*), had written, that the palpitation of the heart, which happens from the dropfy of the pericardium, happens "with a kind of indication that the heart moves in a fluid," leaving us at freedom to determine, by our interpretation, whether that indication can be perceiv'd by the patients, as was said just now (*p*) to have happen'd sometimes, or by physicians, who applying their hands, or their ears, to the region of the pericardium, observe somewhat of a fluctuation there, which would be an excellent sign of the disease, in preference to all others, and might be esteem'd pathognomonic, if it could really exist always, and in those also, in whom either the pericardium does not contain, as yet, much water, or the heart is not vehemently agitated therein, but scarcely trembles with a languid and obscure motion, and so no fallacy could at any time take place, either from water stagnating in the thorax, or from the very motion of palpitation, or from any other cause, that may easily deceive the physician. Which deception, perhaps, they have suspected, who have pass'd over the observation of Stalpart, especially as it was not only not confirm'd by dissection, but

(*k*) N. 22.

(*l*) Obs. cir. supra ad n. 23.

(*m*) In cir. ibid. Schol. ad Obs. 21. § 4.

(*n*) Cent. 1. Obs. 36.

(*o*) N. 20.

(*p*) N. 23.

even, perhaps, render'd something doubtful, by reason of the entire cure of a disease of that kind.

But Vieussens, although (g), after having promis'd four observations relating to the dropsy of the pericardium, in the third, which relates to the dropsy of the lungs, he does not say a word of the pericardium, and in the second describes a dropsy of the pericardium, join'd with other disorders, yet, in the first, describes it disjoin'd from the dropsy of the chest, and all other disorders, and also in the fourth; unless, perhaps, you also believe, that polypous concretions happen long before death, and do not consider the compression of the lungs as an effect of the distended pericardium, which it very evidently is. The first, therefore, which was made on a boy, has these symptoms: In the beginning, from a lively, brisk, and well-colour'd youth, he became sad, slothful, with his eyes less vivid than usual, pallid, and his lips and eye-brows verging to a leaden colour. If he walk'd a little faster than usual, or went up stairs, his respiration became difficult, and the palpitation of his heart, with which he was constantly troubl'd, more violent. The disorder then greatly increasing, he lost his appetite for food, and the strength of his body, the extremities of which were constantly somewhat cold, and his feet very much swell'd; but his pulse was always very soft, weak, small, frequent, and somewhat unequal. Finally, being taken with a slow fever, he died.

But the fourth observation, in which there was much the most considerable dropsy of the pericardium, describes a man of a melancholy temperament, who had always been extremely well in health, till a year before he began to labour under a difficulty of breathing, which had so increas'd by degrees, that at length, for three or four months together, he was forc'd to sit up in bed night and day, for fear of suffocation. He was at that time lean, without any swelling at all, so much as of his hands or his legs; but both of them, for the most part, were chill. His eyes were very dull, and heavy; but his face, and particularly his lips, left by translating the words of the author into another language, I render them obscure, or ambiguous, *d'un gris de fer obscur*, which we may render in English, of a dark iron grey. Being bidden to lie on his right side, and, in like manner, on his left, he lay with equal uneasiness on both; but he lay on his back with still greater uneasiness; and then the colour of his face became more dark, his pulse more small, frequent, and unequal, and the extreme parts of his body seem'd still more cold. This man, although he could at that time go from the bed to the fire by himself, yet died the next day, at dinner, suddenly; Vieussens having both foreseen, and foretold, the disease, and death. And from comparing the two cases together, you will perceive what indications he might have follow'd, taken from the first observation, made upon that boy. At least, he confesses, in the second observation of these four, that he was led to distinguish the same disease soon after in another boy, although it was join'd with others, and in particular with the dropsy of the thorax, from these causes; that in the whole progress of the disease, and a little before the con-

clusion, there had been a palpitation of the heart, that the lower eye-lids, and the nails, were of a lead-colour, that the patient was very sad, and from some other marks of that kind: and indeed in the beginnings, he had observ'd in this second boy, a somewhat palish face, the extremities of the body without heat, respiration not altogether free, especially when he went up stairs, but his pulse very soft, and too frequent. All which things are to be consider'd by me hereafter; in the mean while, if you compare them with the signs of Grætzius (*r*), and Reimannus (*s*), you will immediately understand, which of them are different, which are pretty similar, and, finally, which are the same.

25. Perhaps you will here enquire, what marks led Vieussens to foreknow the dropfy of the thorax in the second boy, beside the dropfy of the pericardium. Because the boy had swell'd legs, and could not lie with his head low, and as often as he turn'd himself on his right side, breath'd with much more difficulty; for these reasons, says Vieussens, I suppos'd, that water was extravasated in the left cavity of the thorax: and indeed the cavity was found to be entirely full of it. Do not however wonder, that in a man, who in like manner, as he said, could not lie with his head low (*t*), there was no dropfy but that of the pericardium; for the collection of water, in this case, was so great beyond all bounds, that the distended pericardium cover'd almost all the lungs: besides, those two other signs were wanting. Finally, the signs of a dropfy of the thorax also, are none of them so peculiar, but even the most skilful physicians are sometimes deceiv'd in distinguishing the disease; which Vieussens (*u*) himself confesses, with a noble example of ingenuousness, to have happen'd to him, and another great man, in a certain youth: and Schreyus has also imitated Vieussens in this ingenuous manner (*x*). For which reason, it is necessary you should the more closely attend, not only to those admonitions I have given you above (*y*), in relation to the signs of this dropfy, but also to my observations, which I am now to produce in their order; for most of them will be, as also those that will be added upon the dropfy of the pericardium, of such a nature, that they unteach, rather than teach; for to do this is not without its advantages; so that it plainly appears, as Vieussens (*z*) says, that it is not so easy to know the "dropfy of the thorax, as some physicians believe, who being ignorant of "anatomy, ascribe too much to themselves, and who never imagin'd that "they ought to have dissected bodies, or inspected them, when they were "dissected by others." For those who have dissected or inspected many, have at least learn'd to doubt, when the others, who are ignorant of anatomy, and do not take the trouble to attend to it, are in no doubt at all.

26. A man of Bologna had a difficulty of respiration, nor could lie on the left side; on the right he not only could lie, but even lay continually. Although he neither lay with his head rais'd, nor had swell'd feet, yet I enquir'd, whether he was ever wak'd in the first hours of his sleep, by a sudden sense of suffocation? which he answer'd in the negative. He complain'd also of a kind of hardness, at the upper part of his belly; which might even

(*r*) n. 22.
(*t*) Ibid.

(*s*) n. 24.
(*u*) ch. cit.

(*x*) Añ. N. C. Tom. 2. obf. 34.
(*y*) n. 9. 11. 15. (*z*) ch. cit.

be perceiv'd, by applying the hand to that part where the pancreas is generally suppos'd to lie; so that any one might have taken it for the pancreas indurated. When the belly was open'd after death, it was discover'd to be the liver, found indeed, but depress'd on the right side, by the diaphragm, the nature of which seem'd to be no longer fleshy in that place, where I have said it was driven. But the thorax, when open'd, shew'd that so great a quantity of water lay on that part of the diaphragm, as to have driven the mediastinum much to the left side, though become thicker in its coats.

27. That the diaphragm has been sometimes so depress'd by the lungs, when enlarg'd from a certain cause, that the liver has been driven downwards, though in other respects found, and taken for a tumour by physicians, I have heard: and that from a quantity of water, accumulated in the left cavity of the thorax, the diaphragm, "in the part where it is perforated by " the œsophagus, was protruded like a bag towards the left kidney, so that " the stomach lay over the liver," I have read in the Sepulchretum (a). However, you easily perceive, what symptoms of the dropy of the thorax were wanting in this man. Yet he breath'd with difficulty, and lay only on one side. But what if even these are wanting? Perhaps you will believe, that I am going to produce, here, the observations of Ruffius in a virgin, and of Wepfer in a young man, as he who points them out says of the virgin, " that she had the whole thorax fill'd with a foul and ill-favour'd water, " and that she had continu'd quite to death, without any difficulty of " breathing;" and of the young man, " although in the right cavity of the " chest three pints of serum were found, and one pint in the cavity of the " pericardium; yet that he was able, to the last instant of his life, to lie " down with his head in a low posture, and even ascended steep places with- " out any impediment, and went to the top of them, rather by running, " than by walking a slow pace." But you, when you review them in the Sepulchretum, for there it is that both one and the other observation is related, when the question is of tabid bodies (b), will find, that the young man did these things I have mention'd last, when as yet there seem'd to be no water effus'd; but that afterwards, " he had breath'd with difficulty;" and although " he walk'd with a slow pace, had taken breath frequently, " with a distended chest;" and that the virgin " had expanded the alæ nasi, " at the time of expiration, but had not any remarkable dyspnœa." It is enough, therefore, that both of them lay down, and the young man, without doubt, always " in a low situation." But I will here give you an observation from our Mediavia, communicated to me by him, according to his custom, on the very day he made it, that is, on the nineteenth of March 1745; from which you will perceive it sometimes happens, that although the thorax is full of water, not only the two signs, which were not wanting in the man, whose history is now in question, but even the others, which are esteem'd the chief, are all wanting.

28. A wool-comber, a man of a middle age, and of a thin habit of body, had receiv'd a wound, some days before, on his scapula, with a knife, in

(a) l. 2. S. 7. in Schol. ad obs. 25. in Additum.

(b) Sect. ead. obs. 91. & in Additum. obs. 48.

such a manner, that a finger might be thrust through the very bone, in its broad and thin part. It was manifest that there was pus betwixt that bone and the ribs, which was discharg'd in great quantity, by an artificial opening that was made in a more depending situation : but whether pus was within the cavity of the thorax also, and whether the wound had penetrated into this cavity, or not, was uncertain ; for although something bloody had been observ'd in what he expectorated, it was not sufficiently clear, whether in him, who was a wool comber, and a thin man, this ought not to be imputed rather, perhaps, to some former taint than to the wound ; especially, as all other symptoms of wounds penetrating into the cavity of the thorax, and of humours extravasated there, were wanting. 'Tis certain, however, that he lay with his head low, and on either side constantly, whenever he was bitten by the surgeon, or whenever he chose it himself ; nor was he ever attack'd with any difficulty of breathing, from the time of inflicting the wound, to the very end of life. About the latter part of his life, his pulse was hard and small. The thorax of the body was accurately inspected, both on the inside and the outside ; and on the outside, indeed, there was a large sinus under that broad bone universally, from whence pus was wont to flow, and in which, even at that time, a very foetid matter was contain'd, within black and strong-smelling parietes ; yet there was no where any communication with the cavity of the thorax. The internal inspection confirm'd the external ; for in neither of the cavities of the thorax was there any pus, but both of them were fill'd with water, and that of a yellow colour, which being at last drawn out, not the least sign or mark appear'd of any passage, or winding aperture, by which that sinus I just now describ'd, could have communicated with the cavity of the thorax. The lungs adher'd to the pleura for some considerable space, and where they were contiguous to the diaphragm, were cover'd with a kind of jelly : this jelly being wip'd away, they were inspected and cut into ; but although they did not seem in good condition, they did not however shew any appearance of disease which was worth much attention, or which might seem to be recent.

29. As to the wound, I should be clearly in opinion that it was inflicted obliquely, and not directly, and that the broad part of the scapula, being by chance turn'd away from that part of the ribs towards which the knife, when pass'd through this bone, tended, the wound was by this means prevented from penetrating into the cavity of the thorax. And, as to the water, I should, without doubt, suppose, that the collection of it in a man who, after the wound he had receiv'd, was continually in a recumbent posture, and therefore inactive, and who had been before us'd to continual exercise, and to live in the heat, had rather encreas'd than begun. But however that may be, this you certainly see, that all the chief signs of so considerable a dropy were wanting ; so that you ought to be less surpriz'd if some of them were wanting in those three observations, which like that first, being formerly made at Bologna, I shall immediately produce.

30. A young man, without any evident cause to which he could attribute the disorder, fell into a difficulty of breathing, before the end of the year 1704. Being on this account afterwards receiv'd into the hospital of St. Mary de Morte at Bologna, he was treated in various methods of cure, but in vain.

Among

Among many other remedies, I know that venæsection being once and again order'd, he seem'd once and again to have a little immediate relief from his difficulty, but that this relief did not remain : and that such medicines as open'd the belly did not afford that relief, although they did not evidently injure. But these things were related to me when I first saw the patient, which was not quite three days before his death, at which time he was very pallid, and breath'd always with his neck upright. When he inspir'd, I observ'd that the lower part of the chest was rais'd very high : he had no thirst, no heat, nor any other febrile symptom of that kind ; yet the pulsation of the arteries was frequent, and the pulsation of the heart, which, when we applied our hands to the thorax, seem'd to palpitate, was much more frequent : and this comparison being often and accurately made, always answer'd in the same manner, and the pulsations of the heart and arteries were always observ'd to be surprisingly unequal. The difficulty of breathing being much encreas'd, he died about the hundredth day from the time the disorder had begun. His face, when dying, and after death, was very much swell'd, but his feet were not swell'd ; about the eyes, and in the abdomen of the carcase was a lividness ; and this cavity being open'd, the omentum appear'd blackish, and cover'd, as it were, with glandular globules, on both surfaces : the spleen was found, but the liver was externally white, and internally approach'd nearly to the colour of tobacco : the gall-bladder was white, degenerating into yellow, and extremely contracted ; and the liver itself was moreover connected by thin cellular membranes, to the parts that lay about it, and especially to the diaphragm, even where it is not us'd to be connected at other times. The peritonæum also, where it invests the diaphragm, was rough, as it were, with some kind of globules, of various magnitudes and forms. Besides all these appearances, there was also a yellow and green water in the general cavity of the abdomen ; but both the cavities of the thorax were fill'd with a water of that kind ; and while it was exhausted with sponges, you might have seen adhering to them with a kind of jelly, various pieces, as it were, of thin membranes. The right lobe of the lungs was connected to the side of the chest by many membranes, such as I have describ'd upon the liver ; and this lobe being drawn to the left side with the hand, the pleura, which answer'd to its posterior part, appear'd as if it had receiv'd several little blows here and there, so that it shew'd the blood stagnating there, of a high florid colour : but the left lobe of the lungs, in its whole upper and lateral surface, adher'd very strongly with the pleura, which in those parts, and in great part of the subjected diaphragm besides, and in the anterior surface of the mediastinum, and where this lies contiguous to the pericardium, was not only rough with globules, as I said the part of the peritonæum was, but was moreover of such a hardness, and thickness, that it greatly exceeded the coats of the aorta, where it rose from the heart, in its density, consisting internally of a white substance, made up of minute particles : and if you compress'd the lungs in your hand, you perceiv'd them to be full of a whitish and frothy ichor ; however, they had no appearance of injury, nor yet the heart itself, unless you should perhaps imagine, that two or three polypous concretions, and those very small, and almost mucous, were of any great importance ; one of which was contain'd in the right auricle, and the other two belong'd to the aorta, and pulmonary artery. Within the pericardium

cardium was some water, very much like what had been found in the belly and chest, but scarcely in a larger quantity than natural. As to what remains of the dissection, I should have added here, what disorder was observ'd in the left lobe of the thyroid gland, if it had not been already sufficiently done in the ninth of the *Epistolæ Anatomicae* (c), as this is the young man of whom I there told you that he had died of a dropsy in the thorax.

31. Although many and various remarks might be made upon this history, yet, for brevity's sake, I will select only a few. And, first, as to what relates to the pleura, it is very difficult to ascertain the true cause, why it should appear like an inflam'd surface, with the blood stagnating therein, on the right posterior part of the thorax. For if you should, perhaps, be willing to accuse the yellow and greenish water, as the cause of this appearance, and suppose that it had been effected by the irritation of the saline spiculæ, with which this water was impregnated; and conjecture also, that the same property inherent in the water of the pericardium had, by vellicating the heart, been the occasion of that perversion in the pulse; we must then, certainly, consider, why, as the same kind of water was in the belly, and the left cavity of the thorax also, it produc'd, neither in one place, nor in the other, similar effects of irritation: and we must even enquire, why it did not produce those effects in the remaining, and greater, part of the right side of the thorax. And, indeed, it is also difficult for me to determine, why, as the pleura appear'd inflam'd in that particular part, there was no pleuritic pain, nevertheless, attending it. Finally, for what reason can we suppose it had become so thick and hard, in so many parts, and to so considerable an extent, on the left side, yet was not thicken'd, or harden'd, at all, on the right? For if you suppose this to be owing to the water that was collected there, the same water was also collected on the right side; so that the explanation of this observation of mine, is much more difficult than that of the seventy-fifth, which in the first section of the second book of the *Sepulchretum*, is unjustly ascrib'd to Franciscus Michinus alone, as I shall presently shew. For in that observation, a very great quantity of water is describ'd "in the left cavity of the thorax only;" and in that cavity only was "the pleura very thick, and callous; and, in like manner, the lungs, the mediastinum, and the diaphragm, were almost callous."

32. I wish, however, I could as readily, and as clearly, explain all those appearances above-mention'd, as I can my animadversion concerning the principal author of that observation. For if you turn to those seven observations of our Fallopius, which are entitl'd, *Observationes de venis*, you will read, just in so many words, in the last and seventh observation, that very observation which is attributed to Michinus; except that a few other things, which I shall produce presently, are thrown in between, and subjoin'd. But that those observations belong to Fallopius, not only his Institutions, and Anatomical Remarks, demonstrate, whenever his discourse happens to turn on the same subjects that are spoken of in the greater part of these seven observations, but even the very words with which he concludes the fourth observation confirm, beyond a doubt: "And this consent of the veins, I, Fallopius, observ'd in many bodies that year."

But that you may not suppose these observations to have been made by Michinus, and to have been rashly adjudg'd to Falloppius, by the editors of all his works, or that Michinus had claim'd to himself what was proper to Falloppius, take this account of it. When Michinus publish'd his Exposition on Galen's Book of the Bones, at Venice, in the year 1570, and added to it those seven observations, which, in like manner, "were first publish'd "at that time," he ingenuously confess'd, in the beginning of the book, "that they all belong'd to the same author," that is, to Falloppius; but "that they had been faithfully copied by him, as a disciple of the author, "and taken from his own mouth, as he publicly taught." And, in like manner, he prefix'd this title to those observations in its proper place: "Anatomical Observations of Gabriel Falloppius, copied by Francesco Michini dello Santo Archangelo, while he dictated them." This is also added by Michini, which betwixt the fifth and sixth observation, in his own edition, indeed, you read thus: "As I had seen and observ'd all these things, in one "and in another body, in the year 1554, both in the private and public "dissections, which the learn'd Falloppius made, and demonstrated; therefore, in order to render the knowledge of this truth more easy and obvious, "I was willing to add the figure of these veins, delineated by Moibanus, "who was my very ingenious fellow-disciple and friend at that time."

I suppose this was that Johannes Moibanus, the learn'd physician, who at that time, as you will easily gather from Mercklinus (*d*), was about his eight-and-twentieth year; so that he might very probably have been present at those dissections of Falloppius, together with Michinus, and have drawn that figure, at the desire of his tutor, which we have among those observations in the works of Falloppius, and is exactly the same with that added by Michinus, except that it is much less. But Michini himself, you will say, saw and observ'd these things. I confess it; but no more than the rest of the disciples did. For Falloppius says, in the fourth observation, "I observ'd "these things, not in one body only, but in many, and demonstrated them "to the students who were about me." And without doubt, he who demonstrates, is the author of the observations; they who assist at, and see, the demonstration, are witnesses only. Nor does Michini arrogate any more to himself than this, where you read these things in the latter part of the seventh observation: "And as we saw, in the same year, two preternatural disorders, "which perhaps rarely happen, and are more rarely seen: I was willing for "that reason to subjoin them, for the sake of students." And he immediately adds what "they had seen in the body of a young girl: presently he says, "But in the body of an adult, we saw a dropsy of the lungs;" and then gives the observation of which we now speak. He does not say, "I "found," but "we saw:" so that you may easily perceive, even from this, that he saw these appearances, while Falloppius "was dissecting, demonstrating, and explaining;" especially as he throws in betwixt the observations the following words: "And my very learned preceptor, Falloppius, "asserted, that this disorder might be call'd the empyema, or dropsy of the "thorax."

(*d*) In Linden. Renov.

I commend, therefore, the ingenuous temper of Michini; nor yet, like Marcellus Donatus (e), do I attribute the observations of others to him. "Franciscus Michinus," says he, "who has publish'd some anatomical observations of his own, says, in the fifth, that he, &c." For how can that possibly be the fifth observation of Michinus, which Michinus confesses "that he had copied from the mouth of Falloppius," as he had done the others? I should rather have believ'd, if the words of Donatus had not so evidently refer'd to these very observations, that some other "anatomical observations" were pointed out by him, which are ascrib'd to Michinus; by those who revise and collect the writings of physicians, or anatomists, while they generally copy one after another, publish'd at Venice in the year 1554, in that very year, to wit, which he spent here among the disciples of Falloppius, not by way of assisting him in his dissections, but for the sake of learning, and improving himself in the science! Yet he might have dissected before. Perhaps he might; but I could not observe the least word, amongst what he publish'd of the works of Falloppius, or in the letter prefix'd, dated "from Fiorenzuola, in the dutchy of Placenza, on the twenty first day of "October," 1569, where he perhaps practis'd physic, from which I could suppose that he was an anatomist. But notwithstanding this is the state of the case, and notwithstanding it has never happen'd to me, nor to the very learn'd Haller indeed (f), as I found when I was revising this letter, to have seen any other observations publish'd by Michinus than these of Falloppius, nor yet to have lit on any person who had seen them; yet I shall not, for that reason, contend, that such never were publish'd. It is enough for me, that while, with the consent of Michinus himself, I asserted to our Falloppius his rights, I have slightly touch'd upon some things relative to the first editions of his works, and to the history of anatomy, which might be a very suitable recreation to you, who are studious of both, by drawing off your attention a little while from the point in hand.

33. Falloppius, therefore, asserted, that the disease describ'd in that seventy-fifth observation of the Sepulchretum, "might be call'd an empyema; "or dropfy of the thorax;" who also, a little below, added the following passage upon the same disorder: "Of which dropfy of the thorax, indeed, "Hippocrates speaks in the second chapter, *De morbis*, and in his book *De affectionibus internis*, about the middle, where he treats of the other species "of dropfy, and calls this the dropfy of the lungs." Wherefore you see already, why that observation begins thus, "In the body of an adult I saw "a dropfy of the lungs." For so it had been call'd in this chapter, with which Falloppius very learnedly join'd the passage of that other book; that we may by this means perceive, from comparing them both together, and from considering the symptoms, and the cure, that it is the same disorder which is spoken of in both places, that is, the dropfy of the thorax, which may be cur'd by letting out the water by incision, when practicable. But as to the manner in which water may be extravasated into the cavity of the thorax, the second passage does not seem to me to hint any thing differently from Galen's

(e) De Med. Hist. Mirab. I, 3 c. 9.

(f) In Boerh. Meth. Stud. Med. P. 7 S. 6.

supposition, who is generally wont to follow Hippocrates: this supposition I have given you above (*g*), which is, that water is pour'd out into the cavity of the pericardium, from ruptur'd hydatids, which are call'd by Hippocrates, in that passage, "tubercles: if tubercles shall have been generated in the lungs, and fill'd with water, and burst into the cavity of the chest." For that it happens thus, "both in the ox, the dog, and fow. And it should seem, that such things must happen more frequently in men, than in beasts, inasmuch as they use a manner of living, that is more productive of diseases."

You see how these very ancient physicians, who, some think, never touch'd upon these species of dropsies, as they had not the liberty of examining into diseases, and their origins, in the human body, dissected and examin'd the carcases of beasts, and carried their conjectures from what they saw there, very sagaciously, to the human species. And it is well known, that similar appearances to these, are at this day seen in oxen, and sheep; and Willis in particular, and Willis, confirm it by their observations produc'd in the Sepulchretum (*b*): and in a fow, to omit other appearances of the same kind, which have been seen by me in beasts, and in men; in a fow, I say, that was in other respects healthy, I remember to have seen an hydatid, which being but a little prominent on the external surface of the lungs, was so much enlarg'd internally, as to contain some ounces of limpid water. But in men, as Fallopius, in particular, saw water extravasated, so his disciple Coiterus (*i*) also, found hydatids afterwards. For after having said, that he had found "one or both the cavities of the thorax full of water, many times, from whence he could assert with Hippocrates, that a dropfy does "happen in the chest;" he subjoins two examples of it, one in the body of a professor at Bologna, whom he dissected, at the entreaties of Jerom. Cardani, his most affectionate friend, and the other in a virgin; in the first of which he found hydatids adhering to all the viscera of the abdomen, and in the last one, indeed, at the side of the cervix uteri, but so large, that it was almost twice as big as the urinary bladder, and quite full "of a thin and "pellucid water," as he says below; so that it is natural to conjecture, in regard to the water, that it had been discharg'd from such ruptur'd bladders, with which the right cavity of the thorax was fill'd, in both of these bodies; especially as in the first section also of the second book of the Sepulchretum (*k*), we read that the lungs of a man were found, after that, by others, "full of "bladders, which being open'd, either water issu'd out," or a pellucid humour, which, although it was then ropy, "like the white of an egg," yet might have been more fluid, in these very bladders, or rather in the others, which had been ruptur'd, and thus have brought on the dropfy, that was found to exist on one side of the thorax.

But perhaps you will here ask me two things; the first, how it can be call'd a dropfy of the lungs, when the hydatids of the lungs being already burst, the water is pour'd out into the cavity of the thorax? The second, whether a dropfy of the thorax is generally brought about in this way? As

(*g*) n. 20.(*b*) l. 2. S. 1. obs. 135. & Schol. ad obs. 75.(*i*) Obs. Anat.(*k*) Obs. 33. & 36.

to the first then, it seems to be properly call'd the dropfy of the lungs, when the ferum is inherent in the lungs themselves, as Tozzius ^(l) and Albertini ^(m) describe as having been found in dead bodies by them, not concealing, at the same time, other things which belong to that disease; to the symptoms of which might be added, according to what Jo. Maur. Hoffman ⁽ⁿ⁾ has hinted, complaints "of a sense of weight, with a tightness and pressure, proceeding from the throat downwards, through the middle of the thorax." And although observations are extant, of this dropfy being join'd with the dropfy of the thorax ^(o); yet it often happens, that hydatids being ruptur'd, when in these the water of the lungs is contain'd, the first disorder goes away, and another comes, which many continue to call a dropfy of the lungs, either in reference to its origin, choosing rather to mark out the cause, than the effect, or else to imitate the example of Hildanus ^(p), who, having found much "ferous water" about the heart, in the pericardium, did not call the disease, a dropfy of the pericardium, but a *hydrocardia*.

Yet as to the dropfy of the thorax, whether it is generally brought on in this way, which was the second question you ask'd me, nobody I fancy will be very ready to assert it, in so great a variety of causes. For to this class belongs, amongst others, that also which you will hereafter see confirm'd, both by Valsalva's observations, and mine ^(q), and which Coiterus, whom I have already commended, had before remark'd also, in his observations, that you have in the Sepulchretum; I mean ^(r), "that there are several diseases, which a dropfy of the thorax may attend upon, and among these peripneumonies, pleurifies, consumptions, and dropfies: for which reason, the cause of this collection of water, in the chest, is not always the same, but they seem to be various, and in great number." And thus this excellent anatomist, by dissecting human bodies, after his master, not only illustrated, but moreover enlarg'd the doctrine of the most ancient physicians. To which I should suppose, that Falloppius also had his eye, when he asserted that the disorder describ'd in his observation, "might be call'd an empyema, or dropfy of the thorax ^(s);" that is, if you attend to the ancient symptoms, very much like to the empyema. For the patient, as it is said in that passage of the second book, *De morbis*, pointed out by Falloppius, "has the same symptoms, as one who has an empyema," but, that we may distinguish the one from the other, "more slightly, and to a longer extent of time." Yet that those who have water, and not pus, in the cavity of the thorax, have sometimes very violent, and quick-destroying symptoms, many of the observations that have been produc'd sufficiently ^(t) shew: and on the other hand, that they sometimes are without all the symptoms, and frequently without most of them; as certainly that young man ^(u), from whose case I took occasion to write these things, had neither "fever," nor "cough," nor "swelling of the feet," nor "contraction of the nails," and yet there was a dropfy of the thorax. But take care how you suppose, that I say

(l) Medic. Part. Pract. ubi de Morbis Pest.

(m) Comment. de Bonon. Sc. Inst. Tom. 1. in Opusc.

(n) Act. N. C. Tom. 1. obs. 213.

(o) ut cit. Sepulchr. Sect. 1. obs. 73. & 77.

(p) Cent. 1. obs. 43.

(q) Epist. 20. & 21.

(r) l. 2. S. 7. obs. 40.

(s) n. 32.

(t) n. 30.

(u) Vid. n. 2. 17.

these things, because I think "the ancient doctrine ought to be rejected, by reason, that it has not an exact certainty about all things." I say them rather, because this very circumstance being ingenuously acknowledg'd, in the book *de Veteri Medicina* (x), those physicians whom I pointed out above, with Vieussens (y), shew themselves to be the most ignorant, when fearing nothing so much among the common people, as to seem doubtful of the nature of any hidden disease, they often do that which Hippocrates (z) so justly blam'd, that is, they pronounce "a disorder to be of a different nature from what it really is." But let us go on to the other observations I promis'd you.

34. A virgin of Bologna, about eighteen years of age, having repell'd an eruption of the scabies kind, by ointment, was seiz'd with a most violent orthopncea, without a fever, and without the other symptoms I just now mention'd. Blood being taken from her arm, to the quantity of six or seven ounces, she became much worse: and the same quantity being taken from her foot, some days after, she sunk under it so much, that the difficulty of breathing grew more violent, and she died on the following day, which, if I remember rightly, happen'd in the year 1703. The body after death was no where swell'd, but had in every part its proper proportion of roundness and plumpness, and not the least vestige of the scabies. In the abdomen was a very livid liver, and harder than usual: the other viscera were sound, and among these the spleen, notwithstanding its upper extremity was almost entirely disjoin'd from the other part of it; so that if there had not been a small continuity on one side of it, there would have been two spleens, instead of one. What observations I made on the parts of generation do not belong much to this place. Yet one or two things, on account of what will be said just now on the breasts, and on account of what we read in the Aphorisms (a), must not be conceal'd. The uterus was perfectly sound, the hymen entire, and in its natural state: yet in the cavity of the uterus was contain'd a kind of glutinous humour, which in its colour resembl'd water, wherein fresh meat has been wash'd. This being wip'd away, some bloody points, as it were, appear'd on the internal surface of the uterus, principally in the middle of its fundus, when the fingers were press'd underneath; and these being a little increas'd by pressure, became real little drops of blood: but certain sinusses that were scatter'd up and down, throughout the uterus, seem'd, in a manner, stuff'd up with blood; so that I by no means doubted but these were the signs of the menstuous blood, which, if this virgin had liv'd longer, would, very soon, have burst forth.

As I was going about the dissection of the chest, I made incisions into the breasts, that were just swelling into maturity; and while I was doing this, I was surpris'd to find, that milk burst out from several places, and even with a kind of impetus or jerk. As soon as ever the knife made a deep impression upon the cartilages of the ribs, a bluish kind of water, with which the whole thorax was fill'd, burst forth. And this being all exhausted, I found the left lobe of the lungs connected to the pleura, only on a part of its pos-

(x) n. 21.

(y) n. 25.

(z) De Morbis, l. 1. n. 5.

(a) Sect. 5. Aph. 39.

terior surface; but the right adher'd very closely to that membrane, on the whole of its posterior, and the whole of its lateral surfaces. The pericardium was also distended with water to such a degree, that before I cut into it, it was very hard to the touch, and made me almost suppose that the heart must be extremely enlarg'd. But, nevertheless, this viscus was found to be of its proper magnitude, containing scarcely any blood in its ventricles, but polypous concretions in each, like fat that is of a white and yellowish colour. The head was not open'd, as the girl had always told me, when I ask'd her in the hospital, that she had no pain, nor any complaint, of any kind, in that part.

35. Amongst other disorders which are the consequences of a repell'd scabies, that a dropsy of the thorax may justly be number'd, this history of mine confirms, even more clearly than that of the very experienc'd physician Storch (*b*). Do not, however, imagine that a physician, by no means unskill'd in his profession, who had bled the patient once and again, suspected that to be the real complaint, and yet still took blood away, agreeably to the opinion of Vallesius (*c*), who in some measure approv'd the practice, rather than to that of Galen, who does not commend the precept, that is extant almost at the latter end of the book, *De Ratione Vitis in morbis acutis*, which, as it is translated by Vallesius, runs thus: "If a dropical person breathe with difficulty, and the time of the year be hot, and the patient at a vigorous time of life, and have strength enough; it is necessary to take blood from the arm." A suspicion of this kind had never enter'd into his head, nor yet into that of the other physician, who order'd blood to be taken from the young man, in like manner as I have said above (*d*). You will observe what happen'd to each patient from thence; yet you will pardon both of the physicians, as neither of them was in the number of those who think themselves infallible, and ascribe all merit to themselves, but none at all to others: nay even both of them, and especially the second, ingenuously confess'd how much was still wanting to the art and to himself, in order to distinguish the nature of hidden diseases, as in this dropsy, and that of the pericardium, which in this virgin, and also in the other three examples that I shall immediately produce, was join'd to the dropsy of the thorax.

36. A woman in the fiftieth year of her age, had been, for many days, troubl'd with a difficulty of breathing, attended with a wheezing; yet the difficulty neither made her incapable of lying down, nor prevented her sleep. But besides that one arm, which was painful, had a swelling upon it, of the œdematous kind (which kind of tumour Fantonus, the father (*e*), and Buchnerus (*f*), and some others, among whom is our Valsalva (*g*), have sometimes observ'd in a dropsy of the thorax) as she said, that upon the motion of the thorax she felt a fluctuation in it, and a weight, even without motion; it did not seem at all to be doubted of, but there was water in the thorax. Finally, an œdematous swelling of the feet was added to that of the arm, three or four days before her death, without the difficulty of respiration being encreas'd; yet the woman was carried off suddenly, as she happen'd to be beginning to take food. She had neither been liable to fainting fits, nor had ever complain'd

(*b*) Aët. N. C. Tom. 5. Obs. 147.

(*c*) Vid. hujus Comment. in Hippocr. locum indicatum.

(*d*) n. 30.

(*e*) Obs. Anat. Medic. 30. & 38.

(*f*) Aët. N. C. Tom. 6. Obs. 50.

(*g*) Supra n. 2.

of any freightness, or constriction, at her heart, nor yet of a pain in her loins, nor finally of any inconvenience that related to the stomach; which I was willing to take notice of here, partly on account of those things which will be written before the conclusion of this letter, and partly on account of what I shall immediately subjoin.

The abdomen being open'd, the stomach was found to be contracted; and within its cavity, near the very mouth of the pylorus, as I have also related, in the third of the *Adversaria* (*b*), was a pretty large caruncle, fix'd, by an oblong stalk, to the internal coats, and of the same colour therewith, if look'd at externally; for internally it was made up of a soft substance, that was red, but degenerating into white, so that it resembl'd nothing more than one of the mesenteric glands, impregnated with chyle. The pancreas, where it adheres to the duodenum, was very thick, and hard; so that I wonder'd the less at its duct being wider than usual above.

Both cavities of the thorax contain'd a great quantity of water, which was of a greenish colour. The pericardium also was distended with water, perhaps ting'd with the same colour; which I say for this reason, because having defer'd for some days to cut into this cavity, as the method of demonstration, in the college of Bologna, requir'd, it was, at that time, of the colour of water in which meat has been wash'd; and, indeed, its quantity seem'd to be diminish'd by this delay, yet it was equal, nearly, to the quantity of two pints. The heart being almost wholly cover'd with fat, nor that thin in its substance, had polypous concretions in the ventricles. Finally, the head being open'd, water was neither wanting betwixt the meninges, nor in the lateral ventricles.

37. Although it was easy to perceive, even in the living body, that there was water in the thorax, yet you see what symptoms were wanting, and what were, at length, added to the first. And indeed we could easily do without all of them, if that one sensation, of a fluid fluctuating in the thorax, were perpetual, without any cause of suppuration having preceded: for sometimes, indeed, that this fluctuation is not only perceiv'd by the patients themselves, but even heard by others, Hippocrates has evidently asserted, in those passages wherein I have said above, this dropfy was treated of (*i*), when he says, "Lay hold of the patient by his shoulders, and shake him, and then listen in which side it fluctuates most;" and again, "In the part where you shall perceive a noise, there cut;" and that is confirm'd by more than one observation of modern physicians, such as I have mention'd above (*k*), and such as the celebrated Fantonus publish'd of his father's (*l*), for this of mine depended upon the feeling of the patient only, and those of the celebrated men, Jo. David Mauchartus (*m*), and Jo. Philip Wolffius (*n*). But this symptom neither is, nor indeed can be perpetual: for besides that you will look for it in mine, and Valsalva's observations, in vain, the same also happens in most of the observations of other persons that you will read, who, it is to be suppos'd, could not have pass'd over this clear and evident mark of the disease, had it really exist'd; and you will even find it expressly denied by some, that it ever exist'd. So in that virgin, and in that Polish senator, whom I mention'd above (*o*), to omit others at present, notwithstanding there was such a quantity

(*b*) *Anim.* 4.

(*i*) *n.* 32. & 33.

(*k*) *n.* 5.

(*l*) *Obs. Anat. Med.* 29.

(*m*) *Eph. N. C. Cent.* 7. *Obs.* 100.

(*n*) *Eorund. Act. Tom.* 5. *Obs.* 34.

(*o*) *n.* 27. & 11.

of water in the thorax, you will read in their histories, that there was no fluctuation, while they were living.

Nor indeed should I suppose you can suspect that in these, and all the former cases, the water was just extravasated, or greatly increas'd at the time of their death: for, in the greater part, some signs were not wanting, of water being before extravasated; and if the question be, in particular, of those whom I just now pointed out, in the virgin, of whom particularly I think I have read that suspicion among some; what increase of the extravasated water, I pray, can you account for from the time of her death, and especially of "greenish water," when "she expir'd placidly, and without a groan?" Or in the senator, who, when "he seem'd to himself to be extremely well, and " was at play, being taken with a natural desire of going to stool, and without drawing for that purpose, was carried off by an instant death? Fluctuation, therefore, that is perceiv'd by the patients, is not a perpetual sign of this disease, and still less that which is heard by others. But it is not even possible, as I said before, that this symptom should be perpetual: as for instance, if there be water, which even others, besides Fantonus, whom I have already commended (*p*), have admonish'd; I say, if there be water either in a very small quantity, or in a very large quantity, so as to fill the cavity of the thorax entirely. For "in those who have an empyema, and in whom, while they " are shaken, there is no noise indeed, but a strong difficulty of breathing, and " livid nails; these," as Hippocrates himself teaches in another place (*q*), "are " full of pus." But you will say, it seems, at least, that this fluctuation ought to be perceiv'd in that space of time, when the water is growing from a small quantity to a large one, nor is yet come to its utmost increase: and indeed it does seem so; but some certainly do not perceive it, as the senator, of whom I have spoken, affirm'd, that he neither felt at that time, nor had, at any time before, felt a fluctuation of fluid in his chest; some do not attend to it; others, finally, do not discover it to the physicians; and the symptoms may be at the same time so few, so slight, and so common to other diseases, that if any one inquires into this symptom, he may be thought to do it without reason; but to lay hold of patients by the shoulders, and shake them, or agitate them in any other way, is certainly not practicable in all patients; which you will see plainly was the case in the patient whose history I am going to relate.

38. A country-woman, not much older than twenty-five years of age, and of a very pale countenance, having been married four months before, was already past the third month of her pregnancy, when she was receiv'd into the hospital at Padua, in which she lay a month or more, with a kind of small erratic fever. Her pulse was neither small, nor intermitting. There was no thirst; though she generally ate fruit, which they did not wonder at in a pregnant woman. She had no swelling of her feet, and no faintings. Nor did she ever complain of a tightness, or oppression, about her heart; nor yet of an anxiety, or sense of weight, nor, indeed, of any inconvenience, or difficulty, in the thorax, whatever; except that, now and then, she us'd to be attack'd with a little dry cough, to which she had been for a long time subject, in the same degree, that is, but slightly. At that time, also, if she

(*p*) Schol. ad Cit. Obs. 29.

(*q*) Coac. Prænot.

took things that were offer'd to her, while they were hot, she was seiz'd with a difficult respiration; for which reason she was us'd to beg that she might have them cold. But, setting aside this accidental circumstance, she breath'd pretty freely; so far was she from being rous'd in the night, with any sense of suffocation, or being forc'd to sit up in bed. She lay down, therefore, as I have said, but it was on her right side: and upon this she lay when she died, without having had any disorder added to the slight fever, if you except a pain in the loins, of which she complain'd only in the latter days of her life.

The abdomen was open'd within half an hour after the decease of the mother, so far at least, that if the fœtus were living, it might be wash'd with the holy water; which was happily perform'd. For the infant, when the uterus and the membranes were cautiously cut into, immediately thrust itself out, as it were, and mov'd its hands; nor did it die till a full hour after its mother. The fœtus being taken out, I diligently dissected the uterus, with the adhering placenta, and membranes, and the remaining part of the woman's body, on the same, and on the following days, before the beginning of December, in the year 1724. But, deferring some things to other occasions, I shall speak scarcely of any thing here, but what was preternatural. Believe, then, that all the other parts were in extremely good condition, as the whole habit of the body certainly was, the muscles being very ruddy, and well-colour'd, and having a proper quantity of fat, of the best consistence, to cover them, and betwixt their fibres; so that but just a little quantity of water appear'd to be lying therein, where neither in the living, nor in the dead body, before dissection, it had seem'd to be, that is, in the extreme parts of the feet: but it does not escape me, however, that this may possibly be charg'd to the account of her pregnancy. The spleen was a little larger than it ought to be; and the liver much more so, as it extended itself both lower than it us'd to be, and across quite to the spleen. It was externally pale, and internally a little variegated with its own colour and that of tobacco, but not hard. The stomach was contracted almost in the middle of its length, and swell'd out on both sides, but less on the right, which part descended obliquely: the other, being plac'd transversely, with its fundus turn'd a little forwards, was half full of fluid and air. In the small intestines were many round worms; and where they were lodg'd, the intestines were reddish, and especially in one certain part, and in that place they also protuberated in their coats, as if they had been dilated by force.

Before we cut into the chest, we observ'd that the neck was tumid, from the fullness of the thyroid gland; and that milk was easily press'd out from the breasts. The thorax being laid open, behold that which afforded an occasion of enquiring very accurately into all the appearances and symptoms that had preceded, and describing them; as I have done here. In the right cavity was a large quantity of yellowish water, and in it were a thick, but mucous kind of membranes. And some water of this kind there also was in the left cavity; but in the pericardium so much, that it was almost full, nor yet without such a kind of membranes, or webs, swimming in it, as I have just mention'd. Finally, in both the ventricles of the heart were

polypous concretions, as if of a kind of mucus; but a little more dense in the left.

39. The paleness of the face, the slight fever, the dry cough, and the lying-down on one side only, had, indeed, been observ'd in this woman: yet the other symptoms, and those in particular which are said to be proper to the dropfy of the thorax, had not existed. But you will say, what were the peculiar marks of the dropfy of the pericardium, in this woman, and the two I have spoken of just above? Yet before I answer any thing to this question, suffer me to give you a fourth dissection, which I made at Bologna, with Valsalva, about the end of the year 1704.

40. A man, of more than forty years of age, who travell'd on foot, frequently, from Imola to Bologna, and from Bologna to Imola, carrying goods backwards and forwards, from one place to the other; this man, I say, when he was hot from his journey, was us'd to drink, and especially in the latter part of his time, when he had a continual thirst upon him; and, being seiz'd with a violent fever, and a defluxion of rheum upon his fauces, was taken into the hospital at Bologna. Presently he began to complain no more of his fauces, and said that all his disorder was in his belly; yet complain'd of nothing more than a pain in the spine, about the lumbar region, by which that seem'd to be cutting, as it were, into two parts. Some of the physicians suspected, that the man labour'd under an inflammation of the bowels; but Valsalva suspected the disorder to be in the thorax. The pulse was weak, however, and low; and yet seem'd to be oppress'd, as we say. He would often rise up, as if he were going away. And in this manner he died, within the third or fourth day from the time he came into the hospital.

In the abdomen every thing was natural. But in the thorax, and particularly in one part, a humour stagnated, in which pieces, as it were, of the most white and thin membranes swam; so that it very much resembl'd the whey of cow's milk, having the small particles of the second sort of cheese mix'd therein. The vessels of the pleura were more red than usual, but not very much. Yet the pericardium was so distended, that upon the slightest prick, it threw out a small stream of fluid, like a fountain, to a very considerable height. The apex of the heart was a little more red than usual, and seem'd to have been slightly inflam'd. Finally, when I dissected the head, I first observ'd, that most of the teeth were wanting, and those that remain'd were all of them black; some of them in great part carious, and others almost altogether so. Was the reason of this, do you think, that he us'd to drink when he was hot? Or, rather, was it from the injuries of the air, to which he had been at all times expos'd? The cranium being then open'd, much water was found betwixt the dura and pia mater. And the former of these membranes had muscular fibres apparent about the processes, if any one ever had. But the vessels that crept through the pia mater, where-ever it invested the brain, were all very turgid with blood; but not so those which were in the lateral ventricles. Finally, the basis of the cerebrum, and the substance of it, that was nearest to the basis, were flaccid.

41. As to the patient's rising up often, as if about to go away, it was evident

dent from thence, that he was, in some measure, delirious; and the cause of that delirium is to be sought for in the vessels of the brain being so distended, or in the acrimony of the water which lay about the brain. For in the thorax, the same kind of water may seem to have inflam'd both the pleura, and the apex of the heart. What if part of it, also, having fall'n from the cavity of the cranium, into the tube of the spine, was the cause of that most violent pain in the loins? For nothing is more natural than, where we see water effus'd into many of the cavities of the body, to suppose that it is effus'd into some others also. And this I say, lest you should, perhaps, believe, that the pain is so to be accounted for from the dropfy of the pericardium, as to be number'd among the symptoms peculiar to that disease, and to have no other cause but that; especially as in the woman also, of whom we spoke last, a pain of the loins came on (*r*), and was "very violent" in the young man, whose history being describ'd by Blasius, is transferr'd into the Sepulchretum (*s*). Both of them, certainly, had a dropfy of the pericardium, and this young man in particular; yet in neither of them were other symptoms wanting, to which that pain might have been imputed. Valsalva himself, in regard to the man at present in question, drew a conjecture from this pain, not that the pericardium in particular, but in general, that some part of the thorax was affected. And you can even certainly remember, what I have written to you on another occasion (*t*), that he was wont to deduce a troublesome sense about that part of the spine, from the appendages of the diaphragm, that were irritated, or press'd upon, being affected thereby; yet in such a manner, that he suppos'd, from thence, water to be collected in the thorax, rather than in the pericardium. And although in the body which I was speaking of at that time, as in this also, water was found to exist in both places; yet in another man (*u*), who "had a most " excruciating pain in that part of the back, where the diaphragm divides " the middle and lower region of the body," a ferous humour was found in the thorax, and not in the pericardium. But the pericardium, you will say, the more it is distended, so much the more does it distract the tendinous part of the diaphragm, to which it is very closely connected: wherefore, as it affects the diaphragm, not only by oppressing it with weight, but also by distracting its fibres, the pain should seem to be owing, rather, to the pericardium being fill'd with water, than to the thorax. But, if the case is as you conjecture it to be, what is the reason, then, that in scarcely any of the other observations made by Valsalva and me, and comprehended in this letter, the patients ever complain'd of such a pain? Was it, perhaps, because the pericardium was not so much distended? It could not be more distended than it was found to be by Grætzius (*x*) and Vieussens (*y*); nor was the pain, for this reason, mention'd by them among the other marks of that disorder. It remains to say, that in their patients the pericardium was gradually distended, but in this man of mine very speedily, so that the fibres of the pericardium and diaphragm could not be gradually relax'd. Do not,

(*r*) N. 38.(*s*) L. 2. S. 1. Obs. 60.(*t*) Epist. 10. n. 12.* (*u*) A&C. N. C. Tom. 6. Obs. 50.(*x*) Vid. supra, n. 21.(*y*) Vid. n. 24, & 25.

therefore make use of other examples, taken from us, or from the Sepulchretum, in which you cannot contend that it was dilated in a short time. But on the other hand, read over again the observation of the virgin (*z*), in whom, within a few days, or read that which I shall presently subjoin, of another virgin, in whom suddenly, a great quantity of water was collected in the pericardium, though none of them was affected with a pain of the loins. And I have the more diligently enquir'd into this symptom, because, though as far as I know it has been propos'd by not one, as a mark of this disease, yet it came into my mind, when I was describing the last observation, to see if it might be reckon'd among the other symptoms, which are not perpetual; and perhaps it may sometimes be of use, join'd with other symptoms, to discover the nature of the disorder, when the pericardium is greatly and speedily distended, which I confess did not happen altogether so in those two virgins, as the distension, although it was quick, was not immoderate.

42. At the same time you see, that even this is not constant, which is generally said (*a*), and indeed is very often true, that a dropy of the pericardium comes on gradually; for it sometimes happens in a very short time, just as the dropy of the thorax does; and this you will know much better, when you shall have read over the observation of the celebrated Löw (*b*), or when I produce our histories of inflammations in the thorax (*c*); and to these I would have you add the observation which I shall give you by itself hereafter (*d*).

I will now add that which I have just promis'd, and which you ought to esteem so much the more, as it is one of those very rare cases wherein the dropy of the pericardium was the only disorder that was found, to which all the symptoms the patient had suffer'd might be ascrib'd; and also because it has been related and confirm'd to me, more than once, by a physician who was extremely diligent in searching-out and remarking all the symptoms, I mean Hippolyto Francesco Albertini. I have reserv'd this history on purpose to this latter part of the letter, that after having given it, I may more certainly and easily explain what we ought to think of the other marks of this disorder.

43. There was at Bologna a nun, whose illustrious family and convent I might mention here, if I chose it, whom a physician had cur'd of a defluxion upon her gums and cheeks, by giving her sudorific decoctions of the woods; and afterwards, being seiz'd with an acute fever, had restor'd to health with equal success. Though he might have been content with one and the other of these successful cures, yet, as some are diligent to a very ill purpose, when the month of April return'd, he began to urge this virgin, that she should not let slip a time so opportune for the taking of those remedies by which she had preserv'd herself from the defluxions. She at first refus'd to comply, inasmuch as she was in very good health, and thought her constitution sufficiently alter'd and rectify'd by the decoction and the fever together; yet as the man very often inculcated the necessity of such a treatment, she at length consented, but unwillingly, as if her mind had, in some measure, presag'd what would happen; for having taken as much of the same syrupus aureus, as it is call'd, as others in the convent had taken, on that very day, with every one of whom it had succeeded extremely well; with her, whatever was the cause of so unex-

(*z*) n. 17.(*a*) Vid. n. 22.(*c*) Epist. 20. & 21.(*b*) Eph. N. C. Dec. 3. A. 5. Obs. 154.(*d*) Epist. 43. n. 15.

pected an accident, it occasion'd near fifty motions to stool; by which, as generally happens after a great quantity of serum being discharg'd, an intolerable thirst was brought on, that did not remit upon drinking a very large quantity of broths; and, for this reason, the physician order'd her to drink a very large quantity of dilute emulsions; nor did the quantity of urine that she made, answer at all to the quantity of fluid she took in. The day afterwards, having sat up in bed, with an intention to rise, and having begun to put on her cloaths, she was suddenly seiz'd with a kind of oppression at her heart, to which a fainting fit succeeded; and from that time, this oppression never fail'd to be exacerbated as often as ever she spoke or mov'd too much. Many physicians were sent for, whose opinions, as generally happens in disorders of this kind, being very different from one another, Albertini was added to their number. It was now the month of July: when they came together, one began to conjecture a polypus, another an aneurism, another a tubercle of the lungs; nor were they wanting who had a suspicion of a dropy of the lungs, or the thorax. When it came to Albertini to give his opinion (whose cautious delay in this case I was always better pleas'd to imitate, rather than the bold hastiness of some) he affirm'd, that it did not become his modesty to undertake to determine immediately, from having seen the patient but once, what so many men, excelling in years, authority, learning, ingenuity and experience, could not sufficiently have determin'd upon in almost three months; and begg'd, therefore, that they would permit him, by visiting the patient once or twice more, to endeavour to find out the nature of so obscure a disorder, which he should perhaps better understand from what he might see than from what he had heard; and after visiting the patient diligently several times, and considering not only the symptoms that were present, but what were absent also, with great attention, he call'd together again the council of physicians, and first gave them his reasons one by one, why it seem'd less probable to him that the disorder was of the kind any of them had mention'd, than that it was a dropy, and that of the pericardium: a dropy surely, for it had taken its origin immediately from the time of so much water being carried into the constitution, which had neither been discharg'd again from the body, nor could in so short a time have been mix'd with the blood; for which reason, a portion of it must be suppos'd to have fall'n upon some part or other, that by the original constitution, as frequently happens, was more dispos'd to suffer it than other parts; and that the dropy was of the pericardium, because he had found by dissection, that some had had water collected in that cavity, in whom he had observ'd the same, or similar symptoms while living.

Attend now to those disagreeable symptoms that did not exist in this virgin. She had a good colour in her face; her sleep was undisturb'd; she was regular in her bowels, and in her menstrua; her respiration was equally easy, whether she stood up or lay on her back, on the right or on the left side. Her pulse was neither tense, nor hard, nor chord-like, nor in the least irregular in any way. She had no palpitation, or large pulsation, in the heart; no pain about the region of the lungs; no cough; there was not the least thing, if you except what I have said above, and what I shall say presently, there was nothing, I say, that you could find fault with, or that she could complain of. Albertini, being persuaded by these arguments, did not fall into the opinion
of

of others. And he thought that these signs had a tendency to confirm his opinion, that the virgin found her heart oppress'd, as if with a stone being laid upon it; and that when she did not speak, and was quiet, and free from motion, she was not troubl'd with that oppression of the heart, as I mention'd in the beginning; but if she perform'd any motion, or spoke for any little time, she was immediately tortur'd therewith, the sensation of which she us'd to express thus, as if she was press'd and squeez'd up, with a great concourse of people all round her: and this oppression of her heart, a slight kind of fainting always accompanied; and her pulse, even when she was quiet, was always weak. Which circumstances certainly render'd the cure very difficult; for besides that if by medicines, they should attempt to discharge the collected serum, there was danger, lest that being rather diminish'd, which is necessary to the blood, the circulation should be carried on with much more difficulty through the heart, which was compress'd by the water, and already flaccid by its long stagnation; this was certainly very evident, that whatever remedies were very efficacious, would without doubt have the same effect upon her, as the motion of her body had; and those that were less efficacious, would be of no use at all, or at least not sufficiently advantageous. This was actually the case; and the virgin at length died of the disorder, as Albertini had predicted, when he consider'd these things. For when she had dragg'd on life, to about the end of a year, from the beginning of her disease; a momentary sense of pricking began to be added to the other symptoms, which return'd every now and then in the part affected, attended with slight convulsions in the same place; the pulse began gradually to be more and more weaken'd, and in a manner obscur'd; which were not fallacious symptoms of death being now at hand.

It was permitted to Albertini to open the thorax, in order to discover the nature of so abstruse a disease, Robert Muratorio, a senior physician, and an eminent man, being added as his only companion in the dissection. Every thing was found to be sound, and in proper condition, except that the pericardium was tumid with water, to the quantity of nine ounces, and the membrane of the heart had begun to be evidently eroded, without doubt from the same water, which was at length become very acrid from its stagnation, from whence that sense of pricking had been felt, and those slight convulsions had happen'd.

44. You have the history just as I wrote it down, after having receiv'd it from Albertini, containing not only such observations, as teach us what we are not to inculcate upon patients, who are unwilling to observe it, and what we are upon occasion to imitate; but, in particular, such remarks also which may be of service to us to distinguish the disease in question. And whereas it is said in this history, that Albertini had also observ'd the signs of it in others; you may read what he has in general advanc'd, in the Commentaries of the Academy of Sciences at Bologna^(e), in relation thereto, and compare it with the observation of this virgin, which I suppose he has his eye to, when he says, "that he had seen the surface of " the heart slightly corroded, in the carcase of a woman." Nor would I

(e) Tom. 1. in Opusc.

have you be surpriz'd, that where the water was erosive, he says that some things happen'd otherwise, than they are related in the foregoing history of the virgin; for neither was the water in her, at first of a corrosive nature, as it was at the latter end of the disease, when the very infirm state of the fibres of the heart was no more able to produce a quick or tense pulse; and yet those slight convulsions which were observ'd at the heart, were a proof that there was something different at that time, from what had been before, although the patient was at rest. But you will believe that the difficulty of breathing, which happen'd from motion, "or rather," as he calls it, the "apnoea," or total privation of breath, which soon became evanid, was scarcely different from those short kinds of fainting, or swooning, which though he had certainly observ'd in the virgin, he did not however particularly express in the Commentaries. The other things contain'd in these Commentaries, in general, do not differ from the history, as it is here, or at least only in the different quantity or quality of the water. And the quality itself, although by stagnation, as I have said, it may be chang'd in the manner that is explain'd by Grætzius (*f*); yet even may in the beginning be very different from a watry nature, as without doubt, the serum of the blood is very different itself also. For I have frequently seen, that this has been discharg'd from morbid bodies, either of a yellow colour, or verging to a green, a blue, or a white, as the fluid very often is, which we see extravasated in the belly, or thorax, or finally in the pericardium, of this or that hydropic patient; from whence they might fetch an argument, who do not doubt but the water of the pericardium is brought thither, not by glands, but by the most slender arteries; although where some certain particles are too prevalent in the serum of the blood, the same, in like manner, so predominate in the humours secreted by the glands, that the saliva of those, in whom the kidneys have for some time ceas'd from their office, has seem'd in colour, taste, and odour, not to be different from urine (*g*). But of what kind the water of the pericardium is naturally, is not justly argu'd from those experiments of Vieussens (*h*), in which he saw the water, that was taken from those who had long labour'd under a dropsy of the pericardium, coagulate either at the fire, or even of itself, and when mix'd with the tincture of the flowers of mallows, become green, and finally, that the salt drawn out from that water, was excited into fermentation by what they call acid spirits. So neither should I rightly argue from that experiment of Valsalva (*), in which, having taken water that had stagnated in the thorax and pericardium of the same body, he saw a portion of the first coagulate, when applied to the fire, but the latter did not coagulate; that the fluid with which we find the one and the other cavity to be more or less moisten'd, is of a different nature in one from what it is in the other: for, without doubt, that these things vary, both from the different time of stagnation, and the different morbid diathesis of the blood and viscera, not only reason indicates, but many other things, as in part, also, the experiments of our Valsalva (*i*) confirm. But as to the quantity of water in the pericardium (which

(*f*) Disp. cit. supra ad n. 22. § 19.

(*g*) Vid. Epist. 41. n. 5.

(*h*) ch. 1. cit. supra ad n. 24.

(*) Vid. supra n. 2.

(*i*) Vid. supra n. 6. & 10.

that very ancient author of the book *De Corde* (*k*), first asserted, as far as I can find, to be found in small quantity, even in healthy bodies) that it is not only in a large quantity in diseas'd bodies, and especially those who are affected with a dropsy of the part, but that it is sometimes in almost an incredible quantity, is even evident from the observations above mention'd, or describ'd, that is in proportion as the cause is greater or less, or has lasted for a longer or shorter space of time, whether it consist in an obstruction to the reflux of humours, or the increas'd afflux thereof; and whether this happen from the quantity of serum being redundant in the blood, or from its motion being too long retarded about the præcordia, either by reason of some fault in the organs, or from any other cause whatever; or, finally, to omit other things, and amongst these the lymphæducts of the heart being ruptur'd, from the follicles of hydatids bursting asunder. For after Galen had observ'd these in an ape, as I have hinted above (*l*), some saw them within the pericardium of beasts, and most anatomists within the human pericardium. Wepfer, for instance (*m*), found many scatter'd here and there throughout the external surface of a fow's heart; and Ballonius (*n*), and Cordæus (*o*), have related, that the heart, in two women, was beset with hydatids. Rollinck (*p*) says, "I have observ'd hydatids on the membrane of the heart, in patients who were subject to a palpitation." Fantonus the father says (*q*), that he saw, in a certain man, "the heart swimming in a very copious and, saffron-colour'd lymph," and the apex of it ulcerated, from a corrupt hydatid;" and in another (*r*), "a great number of hydatids upon the surface of the heart." The celebrated Thebesius (*s*), in a merchant, "the right side of whose thorax being greatly expanded, together with the pericardium, was full of water, found "the external membrane of the heart rough with hydatids." And I myself also, as I have written to you before (*t*) saw the traces, as it were, of a ruptur'd hydatid, on the same membrane, and am to tell you hereafter (*u*), of a large hydatid, which was hanging in the same place. All which circumstances I was willing to take notice of here, that you might the more readily conceive how far this dropsy of the pericardium may vary in the origin, quality, and quantity of the water; and how far the symptoms of it may also vary, as is particularly written, in regard to the pulse, by Albertini (*x*), who always, indeed, found it to be small and rather frequent, but more so when there was the greatest quantity of water; yet he found it soft when the water was pure or viscid; and, finally, tense and chord-like, when the water was salt and vellicating. You will see in Vieussens, of what quality, and in what quantity, the water was in these two patients, in one of whom, as I have related above (*y*), he said the pulse was small, frequent, and unequal; but in the other, besides these circumstances, always very soft and weak. And Hoffman (*z*) has remark'd, that in a certain noble widow, who had viscid serum, as other circumstances shew, within a thicken'd pericardium, in

(*k*) n. 1.(*l*) n. 20.(*r*) Ibid. Obf. 12.(*m*) Sepulchret. l. 4. S. 3. in Schol. ad Obf. 26. n. 1v.(*s*) Eph. N. C. Cent. 4. Obf. 115.(*n*) Ibid. l. 3. S. 27. Obf. 3. §. 12.(*t*) Epist. 3. n. 26.(*o*) Ibid. S. 21. Obf. 21. §. 14.(*u*) Epist. 25. n. 15.(*p*) Ibid. l. 2. S. 8. Obf. 6.(*x*) in Opusc. cit.(*q*) Obf. Anat. Med. 15. ult. edition.(*y*) n. 24.(*z*) Medic. Rat. T. 4. P. 4. c. 9. Obf. 4.

such a quantity as to exceed a pound weight; the pulse was “small and languid;” and when he subjoins what had been observ’d in another widow, by Ballonius (*a*), you would easily perceive, if the amanuenses, or printers, of Hoffman had more carefully copy’d the words of Ballonius, that the woman’s pulse, which was “large, full, slow, and interrupted, having an intermission of “one or two pulsations,” and other circumstances which are related of her, if they really did relate to the dropsey of the pericardium, at least did not relate to that alone, of which the question is here, but to that when join’d with other disorders. Observations of this kind, therefore, being pass’d by here, a great number of which might be readily quoted, those are so much the less to be attended to, which are produc’d after this manner from Zacutus, by men in other respects learned: “Zacutus Lusitanus saw this disorder” (that is, the dropsey of the pericardium) “three times, where the patients “dragg’d on life, under the oppression of faintness, palpitation of the heart, “a hard small pulse, and a syncope, without any preceding cause, and at “length were consum’d by a slight fever coming on; and on account of this “consumption of the body, some have been pleas’d to call this disorder by “the name of a *tabes pericardii*.” But if they had pointed out the place where he wrote these things, which you will find to be the hundred and thirty-seventh observation of the first book, *De praxi medica admiranda*, or if they themselves had read that observation, it would have been easy to distinguish, that those things are not said of the dropsey of the pericardium, or of moisture effus’d into its cavity, but of a small hardish tumour growing on the coat which envelopes that cavity. These observations, therefore, being deservedly set aside, if we look to what is written on the pulse, in the few observations relating thereto; it will appear, that they are different in different persons; and if any thing has, perhaps, been remark’d more frequently than others, that it seems referable to the smallness, weakness, and frequency of its pulsations: and how far these circumstances may vary, not only according to the different time of the disease, but even to how many other diseases they are common, is sufficiently known to all.

45. But if now, at length, we compare most of the other signs, or symptoms, of this disorder, which I have mention’d above (*b*), from the observation, or opinion, of celebrated men, with the histories which are describ’d or pointed out by me; it will also be manifest, that some of them are not perpetual, and some, indeed, even not frequent; as, for instance, the swoonings, which were said to happen much more often in this disorder than in the dropsey of the thorax, but you will find to be mention’d in none either of Valsalva’s observations, or those of Vieussens, or mine, whether taken from the dropsey of the thorax, or pericardium, or both together; and you will even find, that in some of mine they are expressly denied (*c*), and that in the last, which is Albertini’s, they are but just slightly hinted at (*d*). I do not, indeed, deny, that they were observ’d in those patients whose histories are given us by Filscher (*e*), by Reimannus (*f*), by Löw (*g*), and by Hoff-

(*a*) Ephem. l. 1. A. 1570. Consil. Hyem.

(*b*) Vid. n. 21, 23, 24.

(*c*) N. 36, & 38. (*d*) N. 43.

(*e*) Aët. N. C. T. 8. Obs. 31.

(*f*) Eorund. Tom. 1. Obs. 170.

(*g*) Eph. N. C. Dec. 3. A. 5. Obs. 154.

man (*b*). But if the dropſy of the pericardium was join'd, in the three former patients, with a very great languor from a long continu'd hectic fever, if it was join'd with a diſeaſe of the valves of the heart, and with a dropſy of the thorax; then the widow, doubtleſs, remains almoſt alone amongst thoſe from whom Hoffman took his obſervations, in whom I know that ſwoonings, or faintings, and thoſe pretty frequent too, did really accompany this very diſorder in queſtion. How then could I ſay, that theſe ſwoonings, even if they were not common to ſo many other diſorders, are very frequently wont to be obſerv'd in this?

Moreover, as to the dry ſmall cough, which was ſuppos'd to be, in general, more urgent in the dropſy of the pericardium, than in that of the thorax, have you read of it being more troubleſome in thoſe whom I have deſcrib'd as being affected with both? Certainly, in thoſe whom I have ſeen, it is not ſo much as mention'd, except in one woman: and the celebrated Kellner (*i*) has obſerv'd expreſsly, that there was no cough in a man who labour'd under both of theſe diſorders. But there was, you will ſay, in others whom Löw (*k*), Bonetus (*l*), and Wepfer (*m*), ſaw equally affected. And I am ſo far from diſallowing it, that I rather wonder it was wanting in ſo many others, whom I juſt now ſpoke of. For water in the cavity of the thorax, is contiguous to the phrenic nerves, the lungs, and the whole tract of the pleura; ſo that, if it be of an irritating nature, it cannot but vellicate, and thus excite a cough: whereas in the dropſy of the pericardium, the water touches none of theſe parts, and conſequently is ſo far from being likely to excite a cough more, that it does not ſeem poſſible for it to excite a cough equally with the other; although, if it be extremely ſtimulating, it may, perhaps, by vellicating the pericardium, draw the annex'd diaphragm into conſent with it; which, however, the water of the thorax will be able to do ſtill more by means of the pleura, that is thinner, and connected to the diaphragm by a much greater ſpace. But they cough'd, you will ſay, according to the obſervations of Harderus (*n*), Schröck (*o*), Erndlius (*p*), and Reimannus (*q*), in whom there was even not a dropſy of the thorax, but of the pericardium. They did cough indeed; but either there were vomicae that occupied the lungs, or lay between the external coat of the lungs, and the pleura; or, if theſe were wanting, other diſeaſes were not wanting, from which the ſeptum tranſverſum, on its inferior ſurface, at leaſt, might be ſtimulated. But if, finally, we conſider thoſe in whom the only diſeaſe was the dropſy of the pericardium, the man, indeed, whom Valſalva diſſected (*r*), cough'd; but neither Vieuſſens, nor Hoffman, mention a cough in theiſ, nor did Albertini obſerve it in the nun. And as he has written in the commentaries, which I have already commended (*s*), that this diſorder, generally, “has either no cough, or very little, join'd with it,” he certainly did not mean a greater than in the dropſy of the thorax.

(*b*) Obſ. 4. ſupra cit. ad n. 44.

(*i*) Aët. N. C. Tom. 5. Obſ. 1. not. 1.

(*k*) Cit. in Eph. Obſ. 154.

(*l*) Sepulchr. 1. 2. S. 2. Obſ. 3.

(*m*) Ibid. 1. 4. S. 3. Obſ. 26. in Additum.

(*n*) Ibid. 1. 2. S. 7. Obſ. 24. in Additum.

(*o*) Eph. N. C. Dec. 3. A. 4. Obſ. 118.

(*p*) Earund. Cent. 3. & 4. Obſ. 141.

(*q*) Aët. N. C. Tom. 1. Obſ. cit. 170.

(*r*) Supra, n. 21. (*s*) Supra, n. 44.

But,

But, on the contrary, as to what most authors say, that the difficulty of respiration is more slight in the dropy of the pericardium, than that of the thorax, I shall very readily acknowledge that it is true, at least, in general, from the judgment both of my ears and my eyes. For how great that difficulty is generally wont to be in the dropy of the thorax, Du Verney, the younger (*t*), admirably well shews, when he places it among the symptoms of this disorder, and considers it as the chief; or when he teaches, that if, after drawing the water out of the abdomen of a person who labours under an ascites, the respiration is not at all, or but little eas'd, water also stagnates in the cavity of the thorax; and clearly confirms his decision either by drawing out the water from the thorax, or by the dissection of the body after death, in the same manner as Jacobus Oæthæus (*u*) formerly confirm'd his suspicion of a humour being extravasated into the thorax, when, although "he had eas'd" the belly, that was somewhat swell'd, "of its bulk of humours," by the help of purging medicines, yet he had observ'd "the difficult breathing not to be diminish'd." And even read over the observations which I have describ'd to you in this letter, and observe once more how laboriously they are wont to breathe who are affected with that disorder, and how often with their necks quite strait. Nor would I have you suppose, that so great a difficulty of respiration is rather to be accounted for from the dropy of the pericardium, than that of the thorax, because you will read, that in most of them both dropsies existed. For they who have observ'd the first without the second, and without the other causes of a dyspnoea (you see why the observations of Kellner, Schröck, Erndlius, Reimannus, Vicarius, and others of that kind, which I purposely pass by, are to be set apart from this place by me); I say, they who have observ'd the dropy of the pericardium alone, without any other disease that could be injurious to respiration, as Hoffinan in the widow, Vieussens in the boy, and Albertini in the nun, certainly do not make any mention of an orthopnoea. Nay, even Vieussens, as I before said (*x*), conjectur'd, that the dropy of the thorax was added to that of the pericardium, in another, from this reason, because the patient could lie no more with his head low: and Albertini not only affirm'd, in the case of the virgin, that whether she stood upright, or lay on her back, or on either side, her respiration was equally easy; but also wrote in general, in dependance on his own observations (*y*), that in this disease "a difficulty in lying down, and "frequent necessity of sitting upright in bed, scarcely ever happen'd." But Valsalva (*z*), although in one man in whom this dropy, as it seems, had already made a considerable progress, observ'd an orthopnoea; and Vieussens did once also, (as I have said above (*a*) from his fourth observation, and shall say again presently) in the last stage of the disease; yet in the observations which I shall give you the copies of, upon another occasion (*b*), made upon two young men, who were taken off by a peripneumony, after having said, that the first "had lain down, and had felt no inconvenience from hanging down "his head," and that the other "had lain so as to keep his head down-

(*t*) Mem. de l' Acad. R. des Sc. A. 1703.(*u*) Sepulchr. l. 2. S. 1. Ob. 76.(*v*) N. 25.(*y*) Comment. cit.(*z*) Supra, n. 21.(*a*) N. 24. (*b*) Epist. 20. n. 35, 36.

"wards," he immediately subjoin'd this, "as most of those persons are wont to do, in whom the pericardium is turgid with a great quantity of water:" and, indeed, in both of them, that cavity was so far dilated with water, that in the first "it might be with justice call'd a dropfy of the pericardium," and in the other "it occupied a great space in the thorax." But Lancisi(c), when he also collected the signs of this dropfy, said the same thing as I have just said, yet in a much different way. For when he had written, that those who labour'd under this disorder had "a difficult and short respiration," and even "from the beginning could not breathe, but out of bed," he says, at length, "near death, they are compell'd to lie down in bed; that is, because the pericardium, being turgid with a pint, or even with a pint and half of liquor, makes a great pressure upon the center of the diaphragm, nor suffers the patients to use any other posture than the horizontal, which is the least inconvenient of any, inasmuch as the pericardium, then ascending towards the throat, presses no more upon the diaphragm." I do not doubt but this celebrated man might have observ'd it thus in some: nor do I deny that which is consonant to reason, which also the observation of Willis(d), on that young man, confirms, who having begun to labour under a dropfy of the thorax, and lying upon his back in bed, "and suff'ring his head to be reclin'd, from the margin of the bed, quite down to the floor," as Willis, for the sake of the experiment, had order'd, "immediately felt, very plainly, the course of the water downwards, toward the clavicle, and at the same time a metastasis, or translation of the pain, to that part." Nor yet do I know, whether I sufficiently understand, why they, I do not so much say, who were troubl'd with a dropfy of the thorax, as they who were troubl'd with a dropfy of the pericardium, even much greater than that which was refer'd to by Lancisi, did not obtain the same ease by lying down. Nay, on the contrary, he who was troubl'd with by much the greatest, as the observation of Vieussens a little before-mention'd shews, in the last months of his disease, which was now far advanc'd, was oblig'd to sit up constantly in bed; for if he endeavour'd to lie down, which it had been in his power to do in the former months, an evident danger of suffocation and death was immediately at hand. Could it be, perhaps, owing, to say nothing of the encreas'd pressure of the sanguiferous vessels, with Vieussens, to this cause, that the pericardium being distended with such a quantity of water, did not oppress the diaphragm indeed, but grievously overloaded the lungs, upon which it lay in that situation, and at the same time so much the more hinder'd their expansion, as the diaphragm ascending higher at that time, the pericardium itself was also thrust up with it. But if the case be really so, you also understand that this symptom, either as it is describ'd by Lancisi, or by others, is varied according to the various quantity of the collected fluid: which, however, in most patients(e), seems, notwithstanding the quantity was the same that Lancisi mentions, or even sometimes greater, neither to have compell'd them in the beginning to sit up out of bed, for the sake of taking their breath,

(c) De Mot. Cord. l. 1. S. 1. c. 5 Prop. 23.
in Schol.

(d) Pharmac. Rat. P. 2. S. 1, c. 13. in fin.

(e) Vid. n. 27, & 36. supra, & Sepulchr.
l. 1. S. 2. Obs. 3.

nor yet in the latter part of their disease, that they should lie down in order to breathe with more freedom; but even whichever situation they chose, the difficulty of breathing was, for that reason, by no means increas'd, although the dropy of the thorax was join'd with the dropy of the pericardium. Which circumstance also prevents us from considering this symptom of lying down easily, as being peculiar to the dropy of the pericardium; and that so much the more, as in those who labour'd under the dropy of the thorax alone, it has been equally observ'd sometimes (*f*).

46. I am not sorry, that I have just now produc'd the observation of Lancisi, although it differs so much from that of Vieussens. For behold, while I was reading this letter over again, I receiv'd from the Imperial Academy at Petersburg their new commentaries (*g*), in which I find, among other curious observations, that of the celebrated Schreiberus (*b*) likewise, of a pericardium which was so extended by about four pints of bloody water, that the lungs being compress'd together, posteriorly and laterally, the pericardium itself "fill'd the middle, and anterior lateral parts, of the chest." Yet in this patient's case, when "the greatest increase of difficulty in breathing was come on,--it was impossible for him to lie down on either side of his chest, "yet to lie down on his back was tolerable for him." In this man, also, the lungs were "closely connected" with the pleura; and even at last, "a white viscid matter, mix'd with a considerable quantity of blood, was thrown "up by expectoration:" besides, the surface of the heart was all over rough with villi, form'd from the serum, indeed, but by which the left ventricle adher'd very firmly to the pericardium. Nor yet are palpitations, nor faintings, mention'd here, but "an oppression on the breast, and a perpetual dry cough;" each of which you will join to what I have said above of the signs of the dropy of the pericardium, or shall say below, the cough only being excepted, because this had existed in the beginning, when an internal inflammation of the thorax, according to appearances, preceded the dropy; and how the lungs were after that, as to their state, you understand from what has been said, and "upon the diaphragm a little portion of yellowish serum fluctuated." But I would have you attend to this, above all things in the history, that notwithstanding there was so great a collection of water in the pericardium, yet an orthopnoea was wanting, which situation of body, from what cause soever it might happen, was so necessary to the patient of Vieussens, when he breath'd. Thus, then, I think I have said enough of faintings, and of cough, and of the difficulty of respiration.

Now let us go on to other things. And thirst, indeed, so rarely happens to attend a dropy of the pericardium, that I would not have it mention'd among the symptoms of this disorder, especially as our Saxonia (*i*) has expressly asserted, that among these symptoms there is "no thirst." Yet, although on the contrary, you will find in the observations, which I have copied from Valsalva, that there was either a thirst, or a dryness of the fauces, always attending the dropy of the thorax; it sometimes happens, that there is none also in this, and that besides others, and in particular besides the ob-

(*f*) Vid. n. 26. 28.

(*g*) Tom. 3.

(*b*) 5. inter Physic.

(*i*) Vid. supra, n. 23.

servation of Rufius (*k*), more than one of my histories confirm (*l*). Wherefore the absence or presence of thirst, will not certainly distinguish these two disorders.

But still less the tumour of the feet, as one which you will read number'd among the signs of the dropfy of the thorax; and yet we see that the same, somewhat more frequently than thirst, attends upon the dropfy of the pericardium, and that it has been wanting, and not very seldom neither in the other (*m*), and sometimes even when both have been join'd (*n*), as our observations sufficiently prove. Fluctuation is almost the only mark which sometimes is perceiv'd in that other dropfy indeed, as I said above (*o*); whereas in the dropfy of the pericardium, I do not remember to have read, that it has even been perceiv'd upon the concussion of the body: although it can only signify, that a dropfy of the thorax is present, and not that a dropfy of the pericardium is absent. But as to what equally relates to the fluctuation in the pericardium itself, to be perceiv'd by the patient, or by the physician, in this manner, or in any other, as Grætzius (*p*) did not judge, that it would be so distinctly sensible, as in the dropfy of the thorax, to I, in like manner, since it may be less perceptible or not at all, or perhaps may be dissembl'd by some accidental fallacy, did not scruple there to affirm, that I acknowledg'd, if you could remove all these objections, it would be before all others, the best sign, and most to be depended upon (*q*).

And as to the slow fever, the wasting of flesh, the sadness, the paleness of face, the eyes being become less lively, the extreme parts of the body being almost cold, and every thing else of that kind, I do not doubt but they may be oftentimes common to both these dropfies; and I even know, for certain, from the other observation of Vieussens himself (*r*), that most of these symptoms are common to both. Nor if I find, that even many of those signs, which have been before examin'd, have existed in any one person at the same time, in whom the dropfy of the pericardium is found, will I for that reason immediately depart from my opinion; but will first consider all other circumstances. There is an observation of Brunnerus (*s*), which I will produce on this occasion, in particular, for the sake of example, though I could, at the same time, produce many others, because although it might have been added to the Sepulchretum, as it was publish'd in the year 1687, I have nevertheless fought for it there in vain. He found the pericardium turgid with water, in a young soldier, who had complain'd of a dyspnoea, and a tightness about the præcordia, and could scarcely breathe in the night, unless in an erect posture; he had thirsted considerably, his feet had swell'd and been œdematous, and he had cough'd, for the most part, "without any expectoration." But this man had sometimes had a kind of turbid expectoration, he had the abdomen considerably swell'd, the scrotum very tumid, and the whole habit of the body somewhat swell'd, especially on the right side, on which he generally lay in his bed. Besides these and other things, which might have been observ'd, even before death,

(*k*) Sepulchr. l. 2. S. 7. obs. 91.

(*l*) n. 30. 38. & Epist. 10. n. 11.

(*m*) *supra*, n. 26. 28. 30.

(*n*) n. 34. 38.

(*o*) n. 37. (*p*) n. 22.

(*q*) n. 24.

(*r*) Traité du Cœur, ch. 16. obs. 1.

(*s*) Exercit. de Gland. in Duodeno §. 5.

amongst

amongst which neither palpitations of the heart, nor swoonings, nor disorders of the pulse, are spoken of, and you even see that mention is made of its regularity; by dissection of the belly, the liver was found to be very large, and eight pints of water were in the cavity; and, to pass by other things, the right side of the thorax was fill'd with water also; so that if even all the symptoms which had preceded, had been in the number of those, which are said by some to be proper to the dropsy of the thorax, or pericardium; yet the complication of disorders would have prevented us from knowing, which they particularly were symptoms of.

47. Since then these two dropsies cannot be sufficiently distinguish'd by all the marks which have been hitherto consider'd; it remains therefore to see, whether there is any other sign so far proper to the dropsy of the pericardium, that this dropsy cannot exist without the sign, nor the sign without this dropsy. And I do not suppose you can believe, that the mark propos'd by Vieussens (*t*), is what we at present are in search of, I mean the eye-lids, and lips verging to a leaden colour, since this may not only exist in other disorders, but it may be absent even in this, as it certainly was in the case of the nun (*u*). Must we therefore rather depend upon those sensations which Albertini (*x*) has confirm'd, that is to say, of a weight lying upon the heart, and of oppression, and, in a manner, of constriction of the heart itself, from any slight motion: confirm'd, I say; for Grætzius has also (*y*) said, that when this disease began to encrease, "a weight was felt to overload, "and constringe the heart:" and after him, indeed, even Lancisi (*z*) has written, that this disorder was join'd with a weight of the heart,--heaviness, "and anxiety of the præcordia:" Hoffman also has told us, that the widow, whom I have mention'd, as being afflicted with the same disease (*a*), "had complain'd exceedingly, of a great weight oppressing the heart, and "impeding respiration." And among these you may reckon the man, who told the elder Fantonus (*b*), "that he was oppress'd with a very great weight "of his chest," unless you, perhaps, suspect that this ought less to be imputed to the serum of the pericardium being very copious, than to the lungs being hard and dense, so that, as Franciscus Sylvius (*c*) had frequently found them, "they might seem to be not at all membranous, but entirely fleshy." You will more readily believe, however, that "the pressure in the chest, "and those great oppressions of the heart," which the celebrated men Schreiber (*d*), and Fischer (*e*), have observ'd in the dropsy of the pericardium, may be refer'd to this place.

But although these things are even consonant to reason also, I am afraid nevertheless that they are not such as we are enquiring after, since I see they are taken no notice of in the accurate observations of Vieussens (*f*), and in the observation of Olaus Borrichius (*g*) expressly deny'd; and, to omit many of Valsalva's, since the senator of Bologna (*h*), and the two women (*i*), in all of

(*t*) Traite cit. ch. 1.

(*u*) supra, n. 43. (*x*) Ibid.

(*y*) Vid. supra, n. 21.

(*z*) in Schol. cit. supra, ad n. 45.

(*a*) n. 44. (*b*) Obs. Anat. Med. 15.

(*c*) Sepulchr. l. 2. S. 1. obs. 50.

(*d*) Vid. supra, n. 46.

(*e*) Act. N. C. Tom. 8. obs. 31.

(*f*) Vid. supra, n. 24. & 25.

(*g*) Sepulchr. Sect. cit. obs. 86.

(*h*) Epist. 10. n. 11.

(*i*) supra, n. 36. 38.

whom I saw a dropsy of the pericardium, made no complaint, at any time, of a sense of weight, or anxiety of this kind at the heart ; and although one of the women felt a weight in the thorax, yet in both the right and left cavity thereof was a great quantity of water extravasated ; and from this it happened that I did not produce the other observation of Fantonus the father (*k*), and of Gerbezius (*l*), Bonetus (*m*), Kellnerus (*n*), Reimannus (*o*), and others, a little time ago. In these, without doubt, I read, that complaints “ of a great load lying upon the breast, heaviness of the chest, an oppressive pain at the bottom of the sternum, strictures of the chest, anxieties and tightnesses of the præcordia, and of the heart being press’d in, as it were, upon itself,” were join’d with a dropsy of the pericardium : but I read, at the same time, that this dropsy of the pericardium was join’d, in the four first observations, with a dropsy of the thorax, and in the fifth, with an enlarg’d state of the heart, and other disorders of that and of the great artery ; which enlarg’d state of the heart, nor that, as the very words of the author are, “ in a common degree,” was also in the fourth ; nor were other things wanting in the second, and in particular “ a schirrhous glandular body,” which, “ when the sternum was remov’d, appear’d to be fix’d by one extremity to the inferior lobule of the right lobe of the lungs, and by the other to the mediastinum and diaphragm.” Wherefore, although I would willingly ascribe the cause of those complaints in part to the water which was redundant in the pericardium ; yet what I did in regard to the former observation of Fantonus, that I was also constrain’d to do in regard to each of these ; I mean, to doubt whether more was to be attributed to the water, or to other causes, which either by their own, and for that reason, greater weight overloaded the diaphragm ; or by freight’ning the lungs, and the heart itself, or the vessels belonging to each, or in any other manner, preventing the quick circulation of the blood through the heart, might bring on those other sensations, of which I have spoken. After which I think it will be less necessary, especially as this letter is already drawn out to a greater length than I intended, to enter into a fresh disquisition, upon these sensations, in order to determine whether they may happen sometimes from another cause, even without any dropsy of the pericardium ; and still less to treat of palpitations, pulses, and pain of the loins, of which I have said enough already (*p*).

48. And, from the whole representation I have made to you of this disorder, you will easily suppose, that we must still wait some time longer before the trepanning of the sternum, and the perforation of the pericardium are put into practice, in order to cure this disease, though they are hinted at by Riolanus, in his *Anthropographia* (*q*), and elsewhere (*r*), if, according to the admonitions of Schröckius (*s*), and Grætzius (*t*), “ We ought to be very certain before such an attempt, of the quantity of the serum being even redundant in the pericardium.” For art has not yet carry’d her improvements so far, as to what I can see of the matter, as to be able very certainly, and evident-

(*k*) Obs. cit. 37.

(*l*) Eph. N. C. Dec. 3. A. 7. Obs. 186.

(*m*) Sepulchr. l. 2. S. 2. Obs. 3.

(*n*) Act. n. c. tom. 5. Obs. 1.

(*o*) Eorund. Tom. 1. Obs. 170.

(*p*) n. 23. 41. 44.

(*q*) l. 3. c. 7. in fin.

(*r*) Encheirid. Anat. l. 3. c. 4.

(*s*) Eph. N. C. Dec. 3. A. 4. Obs. 118.

(*t*) Disp. supra ad N. 22. cit. §. 25.

ly to determine this question. I wish it was in our power, by frequent and repeated observations, if not to remark other signs, yet at least to determine which, out of all these that have been propos'd, occur more frequently, or more rarely, in the course of this dropsy, and at what time of the disease they most rarely or most frequently happen; whether in the beginnings of it, or near its end. For I see, that it is not uncommon for persons affected therewith, to have died "suddenly, contrary to the expectation of those about them, of an unexpected death, of a sudden death;" which various expressions you will find in their various places^(u).

In the mean while, where the symptoms of other disorders are absent, and some of the symptoms of that disorder, which it is certain is near akin to this, I mean the dropsy of the thorax, are also absent, as the sense of fluctuation, especially in the parts of the thorax more remote from the heart, as the necessity of breathing with an upright neck, especially after the first hours of sleep; as the lying down with greater difficulty on one side or the other, for it seldom happens that an equal quantity of water is collected in each cavity of the thorax within the same time; and the other symptoms of that dropsy are not met with at all, or are much slighter, as the swelling of the limbs, the cough, and thirst; but the patient feels, as it were, a kind of weight, in the very situation of the heart, and that upon the motion of the body the heart is oppress'd, and, as it were, constring'd, the breath being in some measure deficient; and that these symptoms are presently remov'd or alleviated, when he has restor'd himself to rest, and that he takes his rest more commodiously when he lies with his head low: where, I say, all these, or many of them, at least, shall be found together; I indeed, on account of the greatest part of those histories which have been above describ'd, or taken notice of, although I will not for certain pronounce, that the disorder is a dropsy of the pericardium, yet shall say that it is extremely probable. But I shall say it the more readily if, besides these, the patient is in the number of those who feel as if their hearts swam in water; or in whom there is some mark of water fluctuating in the distended pericardium, and not elsewhere. Nor, where there are many of those signs which I have mention'd, will I despise some other signs, as especially the palpitation of the heart, notwithstanding there was no more than one, among all the observations I have describ'd, in which this symptom was observ'd; as also the extremities being almost cold, the paleness of the face, and particularly of the lips and eye-lids, verging to a leaden colour, and other symptoms of that kind, which, as physicians sometimes either neglect to attend to or enquire after, or the patients neglect to tell, inasmuch as they are very often unlearn'd and ignorant persons, and labour under more violent disorders, it would not have been surprising if they were pass'd over in some histories, notwithstanding they did really exist. Thus much I had to say on the dropsy of the thorax, and on this occasion of the dropsy of the pericardium also. Farewel.

49. Scarcely had I revis'd this letter, in order to send it you, when John Baptist Molinari, a most learn'd physician, and a very humane man, knowing that I had been without the excellent treatise of Peter Senac, who, besides his

(u) Vid. supra. n. 6. 17. 24. 36. 38. & Aët. N. C. Tom. 5. Obf. 121. & Tom 6. Obf. 143.

being physician to a most potent monarch, the king of France, is a very great man ; I say, knowing that I had wanted, for these five years together, that it has been publish'd, this Treatise upon the structure of the heart, its action, and diseases, very generously took care that it should be brought to me quite from Vienna. Nothing has given me so much pain, for a long time past, as my not being able to get this work into my hands sooner, especially as it was on this particular subject, and has inform'd me of many things ; but I could not help being affected with an ingenuous shame, and great admiration, when I found, that this very excellent man has ascrib'd so much to my poor merits, as neither I can by any means acknowledge, nor any one could ascribe, unless, perhaps, the most intimate and benevolent friend who was very familiar with me, and attach'd to me by every instance of kindness. However, though it was so long out of my power to return at least some grateful respect for so much humanity shewn to me, I do at present gratefully and sincerely acknowledge it, and will never cease to do it as long as I live.

But now, as to the subject of this letter, I would not have you be ignorant, that among other disorders, this illustrious author has written on the dropsy of the pericardium (x) with such copiousness and accuracy, with such ingenuity and judgment, as a disease "that is frequent, difficult to be known, and more "difficult to be cur'd," as he justly says, requires. He examines the causes, nature, signs, and cure thereof, separately and clearly ; and, as to what relates to the cure, he so far changes the place of that remedy propos'd by Riolanus (y), that neither the mammary artery, nor the heart could be wounded, but water might be drawn out of the thorax very advantageously, if, perhaps, the dropsy of that cavity should have impos'd itself upon us, at any time, for a dropsy of the pericardium ; the signs of which he has, however, previously consider'd with so much care, and even encreas'd, in dependence both upon the observations of others, some of whose writings are not in my hands, and upon his own, that he teaches how far it is possible to distinguish this dropsy from that of the thorax, and from other diseases. How far it is possible, I say, for he does not think that he has remov'd all difficulties ; and if I did think so, says he shrewdly, I should shew that I did not sufficiently understand them. But why should I say more upon this head ? since I shall let you have the perusal of this excellent work, as soon as ever I have made use of his doctrine and authority in revising some other letters, which I wish it had been in my power to do in this. You however, when you come to read this treatise, will find many passages by which you may confirm what I have said to you in this letter : but if you should happen to light on any, where our opinions are somewhat different, take it for granted it will be very agreeable to me, that you should chuse rather to be of the same opinion with so great a man, than with me. Again farewell.

(x) l. 4. ch. 5.

(y) *supra*, n. 48.

LETTER the SEVENTEENTH

Treats of Respiration being injur'd from Aneurifms of the Heart, or the Aorta, within the Thorax.

1. **N**OW the internal aneurifms of the thorax are to be treated of, which not only compress the lungs by their bulk, and pervert the motion of the blood through them, but even often overload the diaphragm by their weight, so that they are injurious to respiration in many ways. The principal and more frequent of these are the dilatations of the heart and the aorta. But before I proceed to give you any observations relative thereto, I must endeavour to give an answer to a kind of tacit interrogation that you have made, I mean, whence it could happen, since these disorders are so frequent, as I say they are, that no certain or particular mention is made of them among the more ancient physicians; for as to the passage that we read in the first book *De Morbis* (a), which perhaps somebody might suppose to have relation to these disorders, where it is said, that sometimes "a kind of varix" happens of a vein in the lungs, and might say, at the same time also, that by the term of a vein, an artery is to be understood; as they were wont, in ancient time, to comprehend both under one name; this person, whoever he may be, if he reads over all which is said there, will acknowledge, that those dilatations, referr'd to in that book, are meant for dilatations of the veins, and those of such a kind too, that when they are at length ruptur'd, they do not bring on a speedy death by pouring out a great quantity of blood, but a slow lingering death, by leaving ulcers behind them, and making the lungs purulent. Nor did Martianus (b), nor before him Salius (c), understand it in any other light. Moreover, as we read soon after, in the same place, that the veins of the side also, "become varicose, and are internally elevated;" Salius puts us in mind, when upon this passage (d), that those are pointed out in this manner by Hippocrates, "which are seated internally upon the surface," left any one should perhaps suppose that he meant those "which creep through the intermediate spaces of the ribs, and other internal spaces," where, without doubt, it has been observ'd by succeeding physicians, that dilatations of the intercostal arteries are sometimes brought on: and indeed, patients are said, by that most ancient physician, to become "suppurated" from a rupture of these varicose veins. But in the book also *De Affectionibus internis* (e), where "a varix in the lungs," its symptoms and cure are set forth, if the disease does not remit after the first fourteen days, "the same remedies" are indicated to

(a) n. 10. apud Marinell.

(b) Annot. ad cit. l. ver. f. 219.

(c) Comment. in ejusd. l. S. 3. t. 19. & seqq.

(d) Ibid. ad t. 22.

(e) n. 5.

be made use of, which are made use of “in him who has a suppuration in the “lungs.” But if, nevertheless, any one would distort all these passages, so as to make them signify aneurisms; yet this will be not sufficiently certain, though some are of a contrary opinion; or if we suppose it certain, it is still uncertain, whether it was put down from conjecture rather, or from dissections, especially as beasts, which us’d at that time generally to be cut open, and examin’d, instead of human subjects, are very seldom taken with such disorders as these: and finally, those disorders which I said were pretty frequent, and of which you enquire at present, relate to dilatations of the heart, and great artery, and not to others. And the chief reason that these were not mention’d by those ancient physicians, I suppose, was the very reason which I touch’d upon just now.

2. For after that, in order to renovate anatomy, human bodies began, at length, to be more frequently dissected, mention also began to be made of those disorders. At least, I see that one is pointed out, as being dissected, in the year 1534, by Nicolaus Massa (*f*), “which had the heart enlarg’d to so “great a magnitude, that he had never seen the like in another man;” and by Vesalius (*g*), “the heart of a very learn’d man, in whose left ventricle he “found almost two pounds of glandular, but at the same time blackish flesh, “the heart being like the uterus extended to the bulk of that flesh.” And I also find, that Carolus Stephanus (*h*) saw, “in the carcase of a patient, “part of whose lungs, on the right side, by reason of some injury or other, “was altogether consum’d and corroded, the auricle of the heart on the “same side, which had grown out into so large a magnitude, that it seem’d “to be three times larger than the other.” After these I find others also, and in particular Ballonius, who has spoken of the heart (*i*), “as being “equal to the magnitude of a pretty large head;” and another, as you have it in the Sepulchretum (*k*), so distended with its valves, “and great “artery, that it seem’d to be triply, or, at least, doubly greater than it us’d “to be.” Andreas Laurentius (*l*) found, in the chevalier Guicciardini, “that the heart had grown to such a vast bulk, as to become almost a prodigy, and to take up nearly the whole cavity of the thorax, both the “sinusses of the heart being distended with blood, to almost the quantity of “three or four pounds.” But this case, and after that others, so much the more frequently, as bodies were more frequently dissected, have been taken notice of by others, in different places, who have added with so much the greater accuracy what had preceded in the living body, as the knowledge thereof is more useful to be join’d with the dissection, and yet more, if you except Vesalius and Ballonius, neglected by those who had gone before them.

3. Nor did the certain knowledge of the dilatation of the aorta come to physicians in any other way. Thus Vesalius, for example’s sake, having observ’d a certain pulsating tumour about the vertebræ in the back, in consequence of those things which he had observ’d before, in external aneurisms,

(*f*) Lib. Introd. Anat. c. 28.

(*g*) De corp. hum. fabr. l. 1. c. 5.

(*h*) De diff. part. corp. hum. l. 2. c. 33.

(*i*) Epid. l. 2. in Confit. Autumn. A. 1575.

(*k*) L. 2. S. 8. Obs. 26. § 2.

(*l*) Hist. Anat. hum. corp. l. 9. qu. 18.

said, that there was an aneurism “from a dilatation of the aorta.” But the physicians, nevertheless, did not, beyond a doubt, know, that Vesalius had pronounc’d the truth, till, when the patient was dead, they found this artery so dilated, that “it was almost as big as an ostrich’s egg,” as you will know even from the Sepulchretum itself (*m*), from which you will also understand what that aneurism contain’d, and how far it had vitiated the neighbouring vertebræ, and ribs. This was seen in the year 1557: and thus weight was added to what Fernelius had written, where he taught (*n*), that the palpitation of the heart “had often dilated the artery outwards, into an aneurism of the bigness of a clenched fist, in which, both to the sight and to the touch, there was a pulsation conspicuous;” and also, where speaking of external aneurisms, he subjoins these words (*o*): “An aneurism likewise happens, sometimes, in the internal arteries, especially under the breast, about the spleen and mesentery, where a vehement pulsation is often observed.” For he might have said these things merely from conjecture: nor is every pulsation, certainly, though vehement, owing to an aneurism, as will be shewn hereafter by our observations also (*p*). If it had been otherwise, that excellent physician, Ballonius, who “never in his remembrance had laid his hand upon so highly a palpitating, and pulsating hypochondrium,” as in Joannes Formageus, would never have suffer’d himself to be so far deceiv’d, as not to have acknowledg’d, that an aneurism lay beneath, except from the sudden death and dissection of the patient, as he candidly confesses in his *Consilium* (*q*), written in the year 1575. I suppose he had attended to the great number of passages in Hippocrates, more than to any thing else, that are quoted in that *Consilium*, and in the *Annotationes* (*r*), or are at least pointed out, in which the pulsation of the hypochondrium, or the other parts of the belly, are treated of, that are sometimes so great as “not to be generated either from running, or from fear affecting the heart (*s*).” All which passages, if you will attentively read them over, you will find, belong either to the symptoms of acute diseases, or, if they relate to other diseases (*t*), that they do not, certainly, relate to aneurisms.

But after that dissection, in which the aneurism was found according to the prediction of Vesalius, some other observations were made, in that very age, which relate to the same disorder. Among these, however, be cautious how you reckon up, without any hesitation (*u*), as Freind seems to do (*x*), that of Parey (*y*): for Parey says, that he had found a dilatation of the pulmonary vein, to which if he did not give the name of varix, but that of “aneurism,” he might doubtless do it for the very same reason that he, according to the custom of those times, call’d that vein by the name of the *arteria venosa*. But besides that of Ballonius, which I have spoken of above (*z*), and others of the same Ballonius, on a merchant (*a*), and on a cook (*b*), and

(*m*) L. 4. S. 2 Obs. 21. § 7.

(*n*) Patholog. l. 5. c. 12.

(*o*) Ibid. l. 7. c. 3.

(*p*) Epist. 24. n. 34. & seqq.

(*q*) 107. l. 1.

(*r*) 5, & 6.

(*s*) Epidem. Hippocr. l. 7. in Eratolai filio.

(*t*) Vid. etiam Valesii Comment. in cit locum. n. 4. & in l. 5. Epid. n. 11.

(*u*) Vid. Epist. 24. n. 35.

(*x*) Hist. de la Medec. P. I.

(*y*) Oper. l. 6. c. 32.

(*z*) N. 2.

(*a*) Paradigm. 13.

of others who liv'd in that age, you will do very well in reckoning up with Freind (c), who follows Lancisi (a), that very same observation of Laurentius on the chevalier Guicciardini, which I have in like manner mention'd above (e), who, as he had the heart so dilated, so he also had "the mouth of the great artery so much enlarg'd, as to be equal in bigness to the arm." This is that observation, which, in the French translation of Freind's history, "is said to be a case that is to be found in Laurentius, publish'd by Guicciardini;" which is a new information to us, how carefully every learn'd author, a little before our memory, consulted his own safety, by writing in the Latin idiom, which is well known to other learn'd men.

4. However, in that sixteenth century, and great part of the seventeenth, which follow'd, the doctrine of the dilatation of the aorta made so slow a progress, that in the year 1595, when Johannes Baptista Sylvaticus publish'd his "Treatise of the aneurisms," he mention'd nothing of them, though he treated the subject of aneurisms at large, and in a general way; and many years after Jo. Riolanus (f) asserted, "that an aneurism happen'd but seldom in the trunk of the aorta, by reason of the thickness of the coats:" and moreover, in the year 1670, Joach. Georg. Elsnerus, in other respects a learn'd physician, when he describ'd an aneurism of the aorta, found by Gulielmus Riva, prefix'd by way of title to his observation, *De Paradoxico Aneurismate Aortico*, and made no scruple to affirm, that an aneurism happens "seldom or never in the larger arteries, and that it seem'd wonderful such a thing could be excited even in the aorta itself also." And this is the observation which Lancisi meant to point out (g), when he said, that the aneurism observ'd by Riva, "was express'd in a table, and inserted in the "eighteenth observation, under the care and inspection of a German." For the name of *Ephemerid. s. Germanicæ Naturæ curiosorum*, is either omitted in that place through the fault of the printers, or is so far corrupted, as I have describ'd to you, just as we see many other corruptions of that kind, in the posthumous writings of this great man.

But from that year 1670, quite down to our times, the anatomists taking more and more pains, so many observations were added to the former, that dilatations of the aorta began to be esteem'd no longer rare, or wonderful. And we are at the same time come to such a point, that the causes, occasions, and signs of these dilatations, being frequently animadverted upon, and attended to, this disease, of which the ancient physicians, as you see, had not the least knowledge, and which first began to be known in the sixteenth century, and then not till it began to appear by elevating the parietes of the thorax, and to betray itself by tumour and pulsation, we now believe we can distinguish, and indeed often do distinguish, when it is as yet very small, and entirely hidden, within the recesses of the thorax. For which reason, Malpighi was by no means to be blam'd (b) for recounting among "the improvements of his age," which was also in part mine, "the know-

(b) Ibid. 26.

(c) P. cit.

(d) De Subit. Mort. Schol. ad Obs. ult.

n. 8.

(e) N. 2.

(f) Encheir. Anat. l. 5. c. 46.

(g) De Aneur. l. 2. c. 2. Prop. 21.

(b) Resp. ad Epist. de Rec. Med. S. ud.

“ledge of dilatation of the aorta :” much less was it to be objected to him, “that, in the ancient Greek, Latin, and Arabic schools, aneurisms were “known, and all the books of the ancients spoke of aneurisms.” For the question was not of external aneurisms, but of internal ones, and particularly those of the aorta itself. - Concerning which, if any one out of any of these three schools had left any writing, it certainly would not have escap’d Sylvaticus, who in that treatise of his shews himself so well vers’d in the reading of each of them. For as to what Aëtius (i) has written, that an aneurism “may happen in any part of the body,” there is no doubt but “external” should be there understood; as is evident, not only from his treating of external tumours in that discourse, but also from his perpetual silence of internal, and so much more dangerous, aneurisms; whereas even he gives the signs of external aneurisms, and the method of cure.

5. Lancisi (k), therefore, has with justice written, whereas Hippocrates “made no mention of aneurisms of the arteries,” and whereas “in Galen, “Paulus, Oribasius, Aëtius, Actuarius, and Avicenna, many examples of “this disorder in the arteries are read of; yet in these very writers, as far “as he could see, there was a total silence upon aneurisms of the heart, and “the great vessels thereof, which since that time have been known to the “more modern surgeons and physicians, by the frequent dissection of dead “bodies.” Some observations of which, he himself has mention’d, as I said he had done in regard to the observations of Laurentius, and Riva (l); and that he did the same in relation to the observations of Harvey, and Marchetti, and others in like manner, you will see of yourself, by inspecting his books (m). For he certainly never pretended to conceal, that the dilatations of the heart, as well as those of the aorta, were known before his time. He only complain’d (n), that the histories which he had read among medical observations, of the dilatations of the heart, were less fully and accurately describ’d, than was requir’d for others, and for himself in particular, who was about to propose the doctrine of them as absolute, as far as it was possible for any doctrine to be so. But he call’d these dilatations aneurisms of the heart; which names I shall also use promiscuously with each other, not only because I would not here willingly be drawn into that dispute, what the Greek physicians strictly meant by the word aneurism, but also because it is but just and natural to attribute something to a man who was extremely meritorious, if any other person was, in regard to the doctrine of aneurisms; especially as we see that the most eminent and learn’d physicians have follow’d his custom; unless you perhaps suppose that Ballonius, in the first book of his *Consilia*, not as it is in the *Sepulchretum* (o), “chapter the fifteenth,” but in the hundred and ninth of the *Consilia*, had formerly hinted the same, when he wrote, that “if there be an aneurism in the heart itself,” the disorder is mortal.

I shall give you first, according to custom, the observations of Valsalva upon aneurisms, and then my own, and distribute them in such order, that

(i) Medic. Tetrab. 4. Serm. 3. c 10.

(k) De Aneur. l. 1. Prop. 2.

(l) n. 3. & 4.

(m) Schol. ad obs. 2. Repent. Mort. n. 11. & de Aneur. l. 2. c. 6. Prop. 48.

(n) Ibid.

(o) l. 2. S. 8. in Schol. ad obs. 27.

in the first place, I shall produce the aneurisms of the heart; in the second place, those of the great artery, and in the third place, the aneurisms of both, and yet not all that we have; for many of them it will be more convenient to defer to other letters, and to those in particular, in which I shall speak of sudden death (*p*). But here I shall describe those, which relate to injur'd respiration, illustrating this new doctrine, as far as lies in my power. "Amongst us, says Albertini (*g*), who was very deserving in regard to this same doctrine, "formerly, in the case of injur'd respiration, the names of "a vitiated structure of the heart, and præcordia, were unheard of. But "after observations being several times repeated in dead bodies, the same "names are too much heard of, and too much dreaded in the living." That these dilatations therefore may not rashly be concluded to exist in those where they are not; and on the contrary, that they may be more readily acknowledged in those where they are, it will be of use to compare the observations, which I have comprehended in the two last letters, with those which I shall produce in this, and the following.

6. An old man, about fifty years of age, of an athletic body, but of a palish complexion, began to complain of a pain oppressing the thorax, particularly on the left side, on which he could not lie. He cough'd frequently, but not vehemently, and spat up a kind of serous matter. He was, in like manner, troubl'd with oppressions of his chest, with difficulty of respiration, and with anxieties of the heart. The pulse was at first, indeed, slow, and hard, vehement and chord-like, but afterwards became more quick, and unequal, the hardness still remaining. The abdomen was not tumid, but yet tense. He died. The belly contain'd water. But although the spleen was so closely connected to the liver, that it could scarcely be separated without laceration; yet these two viscera, and the neighbouring viscera also, were sound. Through the intestines and mesentery were no lymphæducts observ'd; thro' the emulgent vessels a few were conspicuous; but throughout the great trunks of the vessels, in the region of the loins, many appear'd, and those very turgid. In the thorax was a serous humour, especially in the left cavity, which was entirely fill'd therewith. The lungs were ting'd with a black colour, and every where distinguish'd with blackish spots, yet preserv'd their natural softness. The heart was immoderately large; but the right auricle itself was equal in bigness to half the heart. And this being wounded, the blood burst forth in a fluid state, as if from the living body. Yet a great part of the auricle was occupied by a soft polypous concretion, which had been produc'd from the neighbouring ventricle, in which was also a portion of concremented blood. The left ventricle also contain'd concremented blood, but more slightly condens'd. The great artery, where it descended in the course of the vertebræ of the back, was remov'd from its situation, to the space of about two fingers breadth, in its longitudinal direction.

7. Whether this separation was an original disjunction, or whether, as there was only a less strict connexion in that part, the vehemence and vibration of the pulse, being added to this native disposition, the artery was disjoin'd thereby, is not easy to determine.

(*p*) Epist. 26. & 27. (*g*) Comment. de Bonon. Sc. Acad. Tom. 1. in Opusc.

But although it may be doubtful, whether the dilatation of the heart, and right auricle, preceded the dropfy of the thorax, or the dropfy of the thorax preceded that; yet, to me it is more probable, that the disorders of the heart were prior to the other, whether I consider what the first pulses were, or how much more easy it is for a dropfy to happen, from these disorders, than for these to happen from a dropfy. Turn to Lancisi (*r*), and see what things he says upon the aneurisms of the vessels near to the heart, and transfer them to the aneurisms of the heart itself, especially in those, in whom, as in this pallid old man, there was a disposition to a dropfy. Nor would I have you ascribe so much to the pain oppressing the thorax, especially in the left side, on which he could not lie, that, forgetful of the heart being immoderately increas'd, and especially of its right auricle, you judge that those things are to be accounted for, entirely, from the fluid occupying the thorax, and more on the left side than on the other; for that would rather have hinder'd the patient, as it generally does, from lying on the right side, than on the left.

8. A man, of sixty years of age, was seiz'd with an orthopnoea. Scarcely could he complain of an oppression of the thorax. The pulse did not vary from the law of its natural motions. At length the difficulty of respiration growing more and more grievous, every day, he died on the sixth day. The thorax being open'd, the lungs were found to be somewhat hard, on the back-part, and ting'd of a black colour. The heart was very large, and contain'd a large polypous concretion, in the right ventricle; which being expanded into the neighb'ring auricle, had so dilated this cavity, that it was equal in size to a large purse: and sent long productions into the neighb'ring vessels, so that a proper quantity of blood could not readily be contain'd therein.

In the belly, above the left kidney, a round tumour appear'd, which was indeed tied to the other neighb'ring parts firmly, by membranes, and adher'd so closely to the ren succenturiatus, as in one part to make a continu'd body therewith. It consist'd of a glandular substance, which in its centre had two sinusses, distinct from each other, and containing a kind of serous humour. A portion of which, being set upon the fire, coagulated: another portion having some spirit of sulphur, as it is call'd, added to it, by degrees became of a black colour, and let fall a sediment, and in the space of many hours was entirely concreted; a third portion, having spirit of salt ammoniac mix'd with it, continu'd still fluid as before.

9. Whether this tumour was part of the ren succenturiatus only, is of less consequence, perhaps, to enquire here, where we are ignorant of what had preceded, relating to that part, than to conjecture, what was the opinion of Valsalva, in regard to some parts of this history. For as in describing it, I have taken great care, as usual, not to add any thing to his opinion, or take away any thing from it, so after I have faithfully done this, now I think it is free for me to understand the thing so, that when he says the patient died on the sixth day, I suppose he means on the sixth day from the time that he began to breathe with his neck upright, or was receiv'd into some hospital:

(*r*) De Aneur. l. 2. in fin.

and as to what he says, that he could scarcely complain of any oppression at his breast, I shall understand it in this manner ; not that he had no oppression at all, but rather suppose it to have been so great, that by reason of the difficulty of breathing, he could scarce speak so as to complain of it. But as to the pulse, which was not vehement, and chord like, as in the former, or in regard to the dropsy, which did not equally follow, I would not have you wonder greatly ; for either disposition or time might be wanting for the latter to take place ; and the heart, either by reason of the right auricle being enervated, inasmuch as it was expanded into the form of a great purse, receiv'd less blood, or the magnitude of the same heart was owing rather to the ventricle being enlarg'd, than to the parietes being at the same time made thicker ; not to say any thing here of the more large and certainly less mucous concretions, which not only occupied the heart, but the vessels also : and although they had not begun to be form'd before those last days of the man's life, yet Valsalva could not have examin'd the pulse, except on these very days.

10. A girl of thirteen years of age, who from her birth had been almost always a valetudinarian, began in the last months to complain of a laborious respiration, attended with a considerable cough, a spitting of thick matter, and a swelling of the abdomen. Besides all this, on the last days of her life, she became much more thirsty, and very hungry ; but after food, a great tension of the abdomen came on ; her pulse was quick, hard, and small ; and the tightness and oppression of her chest were so very violent at times, that more than once she rose up suddenly from her bed, sighing and groaning. At length, being seiz'd with one of these paroxysms, she died suddenly with a great clamour and impetuosity. In her belly was a great quantity of yellow serum extravasated ; the stomach and the intestines were very much distended with air ; the spleen was very hard, and of a black colour ; the left kidney, internally, was in some measure inflam'd ; the thorax contain'd so much serum, that while the cartilages were cut through at the sternum, it burst forth. There was a large thymus ; the lungs were sound, except that the substance of the left lobe had grown so hard, near the larger bronchia, as to resemble solid flesh ; the pericardium contain'd four or five ounces of yellowish serum ; and the right auricle of the heart had such a quantity of blood within it, that it was distended so as to equal almost the bigness of the heart. Both of the ventricles contain'd a polypous concretion, extremely similar to a condens'd mucus ; but that in the right was the largest. As to what remains, the serum both of the pericardium and the belly, when put upon the fire, evaporated, leaving only a crust behind it, which adher'd to the sides and the bottom of the vessel ; but the other left a thinner crust immediately, and this crust was distinguish'd here and there with some striæ dispos'd in the manner of chrySTALLIZ'd nitre.

11. It is probable that this girl had, from her original formation, not only humours but little salubrious and mild, but also a lax and weak structure of the parts, and especially of the right auricle ; from which causes she was almost always a valetudinarian, till that auricle being relax'd into an aneurismatic state, a dropsy of the pericardium, thorax, and belly easily came on, in such a constitution of body ; so that she was carry'd off, not by one disease only, but
by

by many complicated together, and especially in the thorax, which brought on the most violent kind of death.

12. A virgin who, from the very time of her birth, had always lain sick, especially on account of her very great debility, breath'd short, and had her skin ring'd all over with a kind of livid colour : at length, when she came to be about sixteen years of age, she died. She had a heart that was very small, and, towards the apex, in a manner roundish. The right ventricle was of the form that the left generally us'd to be, and the left of the same form that the right us'd to be ; and although the right was wider than the left, yet it had thicker parietes. The right auricle, in like manner, was universally enlarg'd, and twice as big as the left, and twice as thick ; betwixt the two, even then, the foramen ovale was open, so as to admit the little finger. Of the three triangular valves, one had a proper bigness, the two others were less than usual. The sigmoid, which lie at the mouth of the pulmonary artery, were at their basis indeed natural, but in their upper part seem'd cartilaginous, nay indeed they had already a small ossification ; and were so connected together in this part, that they did but just leave a little foramen, not bigger than a barley-corn, through which the blood was sent out. And at this foramen also were some small, fleshy, and membranous productions, plac'd in such a manner, that they might supply the places of valves, by yielding to the blood that was going out, and by resisting that which was about to return.

13. I should suppose that this virgin had the beginnings of that disorder at the mouth of the pulmonary artery, from her original formation ; to which disorder, being gradually more and more encreas'd, every thing she suffer'd when living, and what were found in the dead body, are without doubt to be refer'd : that is to say, the less quick, and less ready entrance of the blood into that artery, from this cause, was a reason why, on the one hand, a less quantity of it should be transmitted through that artery and its corresponding vein, to the left auricle and left ventricle, and from this should be sent to the whole body ; and, on the other hand, that a greater quantity of blood than is natural should remain in the right ventricle, right auricle, and all the veins. From whence the colour of the whole skin, in a manner livid, and the dilatation of the right ventricle and right auricle, and the continu'd communication by the foramen ovale, by reason of its valve being urg'd towards the left side, by the great quantity of blood from the right, whereas but little urg'd it on the left side, and applied it to the edge of the foramen. But, for contrary reasons, the left auricle and left ventricle were neither sufficiently open'd out and dilated, nor sufficiently strong ; and the proper influx of blood to the brain, and to all other parts, being deficient, that very great debility, and difficult respiration were the consequences ; and these even for that very reason, because from the small portion of blood entering into so large and firm a vessel as the pulmonary artery, it could neither be sufficiently expanded and dilated, nor consequently contract and restore itself, as it ought to do, in order to carry the blood properly through the lungs.

And as to this disorder having begun in the virgin gradually, and with her original constitution, when the parts were all extremely lax, you will see that the same thing happen'd, and even much more, within a few months, from a nearly similar impediment, though in a different situation, in a man about

thirty years of age, whose history is describ'd by Vieussens (*s*); for the valvulæ mitrales being become bony, and greatly diminishing the orifice by which the blood goes to the left ventricle, both the capacity of this, and the thickness of its parietes, as figure the second, table the thirteenth, compar'd with figure the second, table the eleventh, sufficiently shews, had been diminish'd: but, on the other hand, both the auricles, with their adjoining trunks, for so he calls the trunks of the pulmonary vein, and the two cavæ, (which Valsalva comprehends under the general name of auricles) and the trunk of the pulmonary artery, and the right ventricle, were much distended, and the columnæ, and fibres of the same ventricle, were become very thick; which might either happen from a cause that will be pointed out hereafter (*t*), or because a greater thickness of the muscles is the consequence of their more frequent and stronger actions. Without doubt, these parts of the heart must have been constantly and vehemently contracted, and exercis'd, in their endeavours to thrust on so great a quantity of stagnating blood into the pulmonary vessels, which, by reason of the difficult entrance into the left ventricle, did not easily admit it: but this ventricle had need scarcely of any nifus whatever, to throw its small portion of blood into the great artery, for which reason the small and weak pulse here also testified the weakness of the nerves, and languor of the whole body. With this history, and explication, I would have you compare an observation pretty much of the same kind, which I lit on by chance, as I was turning over the Sepulchretum, in the second book, after I had written these things (*u*). Thus far I have produc'd some aneurisms of the ventricles of the heart, and of the auricles, found by Valsalva. I will now subjoin others, that he found in the aorta.

14. An old man, aged seventy-five years, of a ready wit, and a sanguineous temperament, a tall stature, and endow'd with a good constitution of body, in general, grew very much emaciated some years before his death, and especially in his last years. At the same time he perceiv'd an oppressive kind of pains, which he had been a long time subject to, in the left part of his thorax, and which were alleviated only by the eruption of flatus, to become more violent, and particularly upon the entrance of his last winter. He was also afflicted with a troublesome cough, with which he very frequently brought up a kind of serous matter, and frequently a matter globose and compact. At the time of a more quick motion, he was seiz'd with a difficult respiration, and that pain in the thorax of which I spoke, sometimes also with a palpitation of the heart, which oblig'd him to stand still. At length, about the third day of January, a little before the latter end of the day, he was taken with a kind of *deliquium animi*, or swooning, with a copious spitting of blood, and a very difficult respiration, with a stertor. About the first hour of the night, those symptoms became more mild from blood letting, a kind of pricking pain of the left side only remaining, upon which he could not lie without much uneasiness: his pulse was weak, rare, hard, and chord-like, but not often unequal. At the fifth hour, all the former symptoms came on afresh, the stertor being extremely sonorous, and

(*t*) Traité du Coeur ch. 16. (*t*) Epist. 18, n. 35. (*u*) In Additam. ad Sect. 8. Obs. 3.

a white matter being mix'd with the blood that he spat up. After this they became a little more mild, till the stertor and hæmoptoe going off about the tenth hour, he died with his mouth gaping quite wide, as if he had taken breath every now and then in this manner.

While the thorax was open'd, serum burst forth from its left cavity, with which, and with coagulated blood, the whole cavity was fill'd, the right being entirely uninjur'd. The lungs were not much different from their natural state; only about the bronchia, some black bodies were observ'd, like glands. In the pericardium were three ounces of serum: in the ventricles of the heart, only a grumous blood, nor that in great quantity. But the aorta, in that whole tract of it which reaches from the heart to the diaphragm, was dilated into an enormous aneurism, yet not every-where equally broad, but in some places less so, and in others, on the contrary, more. It adher'd very tenaciously to the fourth and fifth thoracic vertebræ, which seem'd to be a little incurvated to the right side: and near to these vertebræ it was ruptur'd, and had discharg'd its blood, by a large hiatus, into the left cavity of the thorax. About this foramen there was a polypous concretion, hollow'd out into the form of a little tube; and the foramen itself was surrounded with an ulcer: so that the side of the artery, having been first ulcerated by some corroding juice, and after that the ulcer being made more and more deep, it seem'd to have been reduc'd to such a thinness in its coats, that it could no longer support the impetus of the blood against them.

In the belly, the right kidney was worthy of observation, the lower half of which was in its natural state; but the remaining half was entirely chang'd into a large bladder, made only of a thin membrane, through which an elegant network of vessels was drawn, although of unequal areas, which came to be very conspicuous by injecting a colour'd fluid into the emulgent artery. This bladder was turgid with serum to about the quantity of three ounces, which being set upon the fire exhal'd a kind of urinous odour, and by boiling, and foaming, evaporated away. Another thing also occur'd to Valsalva, that is more worthy to be observ'd. As the chyliferous vessels rose frequent from the small intestines, from eight inches below the pylorus, to about two ells, and went to the center of the mesentery, that tract of the intestines, which I just now pointed out, was distinguish'd with certain whitish spots, and, as he himself says, "irregular with caverns;" some of them being of different figures and magnitudes, so that some were equal to a lentil, others were twice as big, and some less: out of which although he could not see those vessels proceeding, yet he believ'd that they communicated with those same "little cisterns," inasmuch as they were certainly turgid with chyle, the taste of which, when examin'd, he found to be like that of milk, except that it verg'd more to the flavour of salt.

15. That we may omit to enquire, whether those black bodies about the bronchia were really bronchial glands, accidentally enlarg'd beyond their natural size, do not wonder, that, among other appearances which are without doubt morbid, we at last describ'd some things which seem to belong, rather, to a natural state. For those little cisterns may be suppos'd to refer much more to a natural state, than that change of a great part of the kidney into

into a bladder; of which I have written before, and shall write again (x). For there is reason to suspect, that the appearance of these "little cisterns" was owing to the compression of the thoracic duct, by so great an aneurism of the aorta, within the thorax, which left a very narrow passage for the chyle; so that it was oblig'd to stagnate for a while in its way through the parietes of the intestines, and dilate the vessels which carried it into that kind of varices; or, if you would rather have it so, extend certain lacunæ, or reservoirs, in this manner, which were not conspicuous by nature. And, certainly, Santorini (y), who afterwards saw "little cisterns" of the same kind, except that they were of the bigness of a panic, saw them once also, as Valsalva did, in a person who died of an aneurism. The seat of which, although he does not make it known, yet most probably was in the place where it would be able to obstruct the motion of the chyle: and, indeed, I myself, who never observ'd any thing of that kind but once, remember to have observ'd it in a bitch, who was pregnant; so that some compression of the passages of the chyle was by no means wanting. However it is, Santorini and I have evidently prov'd the opinion of Valsalva; since Santorini saw the chyliferous vessels emerge from those "little cisterns;" and I not that only, but other lesser ones also, which went to them. But let us go on to the more certain and more considerable effects of the aneurism describ'd.

16. That this aneurism had begun a long time before, is evidently demonstrated by those pains, which oppress'd the left part of the thorax so long before. As to their being eas'd from the eruption of flatus that might have impos'd upon the patient, as I have seen in many others, who for this reason believ'd they were only troubl'd with a flatulent disorder: that is to say, the part of the thorax, occupied by the aneurism, so presses, frequently, upon the œsophagus, that the passage for flatus to break forth is by no means free and open. The flatus, therefore, distends the stomach, and that part of the œsophagus which is nearest thereto, and encreases the uneasiness, by still more diminishing the space of the thorax, and compressing the aneurism. These uneasinesses must of course, then, decrease, when the flatus has at length got free. Yet they are not remov'd entirely; which circumstance, together with the sense of weight, or any other inconvenience, that cannot be ascrib'd to flatus, ought to admonish the physician not to suffer himself to be deceiv'd, as the patient is. But these circumstances, and others also, which are to be explain'd in another place, are the most easy in this history.

Yet some are far from being easy to be explain'd, among which are these two: the first, how this old man could possibly live ten hours, or more, after the symptoms of a ruptur'd aneurism; and the second, by what means that copious spitting of blood was brought on. As to the first, that celebrated man, Paulus Valcarengus (z), in a case which you may in some measure compare with the present, explains it, by supposing, that the blood was not

(x) Vid. Epist. 38. n. 39. & seqq.

(y) Obs. Anat. c. 9. § 10.

(z) De Aortæ Aneur. Obs. 2.

discharg'd,

discharg'd "altogether, and immediately," from the rupture of the aneurism, "but had flow'd out by degrees." Yet because his patient liv'd only about four hours, and he whom I have giv'n the history of here liv'd so long as ten, there is room to suspect, that the polypous concretion, which was found hollow'd out into the form of a little tube, about the large hiatus of the aneurism, had been once and again, as the twice returning mitigation of the most violent symptoms seems to prove, stopp'd up, as it were, by some portion of a similar concretion, or by coagulations of blood, which the remaining fluid had carried thither, out of the cavity of the large aneurism, till once and again a part of them being thrust out from the little tube, left a passage half open for the alternately-repeated effusion, till at length it was left entirely open.

But as to what relates to the spitting of blood, you may, perhaps, be ready to conceive, that from an aneurism of this kind, some winding sinusses were hollow'd out, either into the neighb'ring canal of the œsophagus, or *aspera arteria*; and that these sinusses, by reason of their oblique course, within that polypous concretion, were less observ'd by Valsalva, especially as he does not seem to have look'd after them. But in whatever manner it is to be explain'd, this however is certain, that others also, while an aneurism was ruptur'd within the cavity of the thorax, had blood likewise coming out from their mouths. So he whom Valcarengus, above commended, describes, "threw up, at the same time, a small quantity of blood, "by spitting."

17. A man of fifty-five years of age, of a small stature, but robust, and very salacious, who sometimes earn'd his livelihood as a waggoner, and at other times by riding post, as a guide to travellers, began, about ten years before his death, to be subject to many and various disorders, at first to fevers, after that to disorders of the spleen, afterwards to a cachexy, and last of all to a dropsy. From which though he had been freed, a year before he was taken off, he nevertheless retain'd a yellow colour of his skin, and a difficulty of breathing. These symptoms were more violent from motion, and were attended with a kind of anguish at his heart. In the neck, and the temples, the arteries had evidently a leaping motion; the pulse was hard, rather slow, and chord-like, but never intermitting, never unequal. He could lie on either side. He often cough'd and spat up something, but it was in small quantity only, and serous. Having a vein open'd, the blood, after concretion (very little serum being separated, and that of a yellow colour) shew'd, on the surface, a white crust, as in those who labour under a peripneumony, which crust was three inches in depth, whereas the red part beneath it did not exceed two inches. After this he began, sometimes, to be seiz'd with faintings, and to grow worse gradually, his face being much swell'd, on the last days of his life. At length, while he was carried from one bed into another, he suddenly died.

His belly being open'd, the intestines were connected on their anterior surface, with the omentum, and on their lateral surface with one another: the other viscera also, were strongly and unusually connected to the parts that were nearest to them. So, in like manner, when the thorax came to be open'd, the lungs were found cohering with the pleura, the right lobe, in-

deed, in most places, where the pleura covers the ribs internally, but the left almost every where, so that it was free neither from the mediastinum, nor from the diaphragm, and scarcely from any part. About the bronchia were a great number of black and hard glands, some of the bigness of a bean, others of the bigness of a barley-corn. But the aorta was indurated, internally beset with bony scales, and dilated to such a degree, that it made an aneurism of three fingers breadth, and of the length of a span: and moreover, about the fourth vertebra of the thorax, it was more dilated, so that the body of this vertebra being hollow'd out, the place of it was occupied by the aneurism, and there it was so closely connected, that it could not be pull'd away without laceration. A polypous concretion, which took its origin from the left ventricle of the heart, was contain'd in this aneurism. In the left cavity of the thorax, some serum stagnated, and besides that a large coagulum of blood, which perhaps had flow'd out from the ruptur'd aneurism, although no evident trace of rupture any where appear'd.

18. Perhaps in no class of men, have I and my friends seen aneurisms of the aorta more frequently, than in guides, post-boys, and other persons who sit almost continually on horseback. Nor is it to be wonder'd at; for even, to omit the other accidents and injuries of air, to which they are expos'd, it must of course follow, that the great concussion and agitation on the one hand, by exciting the motion of the blood, and by urging the sides of the artery; on the other hand, by compelling these parietes, inasmuch as they are shaken, to counteract the strokes of the excited blood, will relax, finally, the structure of their parietes, and make inroads upon their strength. Which so much the more easily happens, where salacity and diseases are added to it, as in this history. To those diseases, and especially to the foregoing dropsy (*a*), I should make no scruple to attribute the cohesions of the viscera, which were found in the carcase. But as to the bronchial glands, they, in fact, were not so much known at that time to every body, yet I should not suppose, that on this account in particular, as also in the former old man (*b*), these glands were taken notice of, but because they occur'd to him, in a more enlarg'd state, or in greater number, or more hard, than is usually in others. As to the bony lamellæ within the dilated artery, I shall write of them on another occasion (*c*), as also, of the neighbouring bones, and those that lye near it, being hollow'd out. It is sufficient here to admonish, that even from the first internal aneurism, which was discover'd by dissection, as far as I know, the vertebrae that were connected to it, were hollow'd out, as I have said above (*d*). When you read that history in the *Sepulchretum*, you will also observe another circumstance relating to the present question; I mean, that this first aneurism "had taken its origin from the leap and concussion of a fierce and unruly horse."

19. A man of forty years of age, endow'd with a good habit of body, began to complain of a difficult respiration, three or four years before, especially after pretty violent motion. This man, about three months before, had a tumour begin to appear in the left part of his neck, hard, and with-

(*a*) Vid. Epist. 39. n. 30.

(*b*) n. 14.

(*c*) Epist. 27. n. 20. & seqq.

(*d*) n. 3.

out pain, and as far as could be discover'd externally, to be refer'd to the species of sarcomata: this being encreas'd by degrees, came to the magnitude of a very large fist; and even seem'd, now, to resemble two fists, plac'd one over the other. The man was receiv'd into the hospital of St. Mary de Morte, at Bologna, when his strength, by degrees, failing him, he was attack'd with a slight fever. His pulse was sometimes quick, and hard, and sometimes unequal, both as to the order and force of its strokes. His head was troubl'd with a violent pain, and also with a slight delirium. His respiration was more vitiated, and attended with a stertor; and his voice so diminish'd, that it was almost like that of a woman. He had some pain in his thorax. To these symptoms was presently added, a difficult, and even altogether obstructed deglutition: and at length his face, and even his whole head, being very red, he died on the seventeenth of December, 1688.

The tumour, which had been hard while the man was living, was now become soft when he was dead. As soon as ever it was cut into, a great quantity of blood immediately flow'd out; and when it was dissected down, quite to the root, it was found to be full of blood, partly concreted into grumi, and partly fluid. The glands which us'd to be plac'd at that part, being greatly indurated, some of them press'd upon the œsophagus, "others" upon the jugular vein itself, both which parts were much thicken'd in "their membranes. And the latter shew'd a laceration in its larger trunk, "as the aorta also did. The tumour being examin'd, the thorax was cut "into." The lungs were distinguish'd, externally, with black spots here and there; but internally, they were fill'd with globules of tartareous matter, in many places, and every where with a great quantity of serum. The right lobe was tied by many fibres to the pleura: the left was entirely free; but very much inflam'd. The right ventricle of the heart contain'd a polypous concretion, which occupied also the orifices of the vena cava, and the pulmonary artery. Finally, the belly being open'd, all the contents of that cavity appear'd sound, except the extremity of the intestine ileum, which was affected with an inflammation.

20. I was in doubt whether I should describe this observation of Valsalva, and if I did describe it, to what class I should refer it; whether to that kind of tumours which are turgid with blood, such as I have more than once found in the thyroid gland (*e*); or to others, that communicate with the trunk of some ruptur'd vein, which Valsalva (*f*), and I (*g*), have both of us spoken of, on former occasions, or rather to those dilatations of the aorta, which are the disorders now treated of. At length, my mind inclin'd rather to place it here, when I attended to the difficulty of respiration, which had begun so long before, and especially after any violent motion. For as to no pulsation being observ'd in the tumour, there are so many causes which may render this obscure, in the progress of the distension, that we need not wonder, if in these last days, on which the patient being admitted into the hospital, the tumour was taken notice of, it was no longer possible to observe it. These causes I have touch'd upon heretofore (*h*), and in the next letter (*i*) I will mention another. In this manner it is I conceive of the affair, then:

(*e*) Epist. Anat. g. n. 39.

(*f*) Tract. de Aure Hum. c. 4. n. 8.

(*g*) Epist. Anat. 13. n. 4.

(*h*) Ibid.

(*i*) Epist. 18. n. 20.

to wit, that the aorta, in the place where it is said to have shown a laceration, when the tumour was dissected, had by degrees dilated itself upwards into the sac which constituted the tumour; and this tumour, by pressing upon all the parts which lay about it, was the cause of most of the symptoms which had been observ'd in the living body; for the aspera arteria and larynx being press'd upon, and consequently being made narrower than usual, render'd the voice less deep and strong; the gula and pharynx being press'd upon first, render'd deglutition very difficult, and at length totally obstructed the canal, so as to allow no passage for the aliment. Finally, the larger trunk of the jugular vein, that is to say, of the internal, being press'd upon, the return of the blood from the upper parts, and especially from the brain, was obstructed; whence pain, redness of face, and slight delirium. Yet because the laceration of the same jugular vein is hinted at, and some things in that part of the dissection are so written by Valsalva, that, perhaps, they may seem to you to be intended in a different light from that in which they seem to me, I chose rather to use the very words of the author, such as I found them, upon that passage, and only to make this one observation, that when he wrote this history, he was not as yet three and twenty years of age; notwithstanding he made another observation about the same time also, in which there is no room for hesitation. This will be the first of the three next following, in which he observ'd, at the same time, an aneurism of the heart and aorta.

21. A poor man, in the sixty-fifth year of his age, being of a sanguineous temperament, and a pretty good constitution of body, began, some years before, to be attack'd at intervals, with a kind of oppression of the chest, with a slow, tense, and chord-like pulse, and a consequent failure of breath and strength: but in the month of December, in the year 1687, being admitted into the hospital of St. Mary de Morte at Bologna, on account of a tertian fever, and the fever now seeming to remit, by the help of remedies, the tightness and oppression of his breast, together with palpitation of the heart, were so strong, that about the eleventh day, he seem'd to himself and others, to be just at the point of death; yet the same symptoms continu'd to the twentieth day, with so great vehemence, that they left him speechless, and almost desperate. But about the twenty-seventh day he complain'd, in the best manner he could, of a very great fullness in the chest, and about the thirtieth day these paroxysms remitting, and his pulse becoming almost natural, he spat up a great quantity of a gelatinous kind of matter, with which a palish brown substance was mix'd. The patient, in the mean while, though he ate nothing, drank freely of wine, which was brought to him privately, from whence he had first an inflammation of the right eye, then of the left, and from that blindness. At length, from continual lying on his back, and from the erosion of the excrements and urine, being seiz'd with a gangrene upon the os sacrum, he died about the fortieth day.

The thorax was dissected with the assistance of Hippolyto Francesco Albertini, who at that time perform'd the office, of assistant physician to this hospital, with great diligence. The lungs adher'd closely to the pleura, which is a circumstance, however, frequently met with in dissected bodies; being cut into, they shew'd a matter very much like to that which had been spit up, except that it was thinner; and the substance of the lungs itself was ting'd of a black colour. In the pericardium was serum to the quantity of a pint and

half nearly, partly yellowish, partly black, and insipid; and the heart was of such a magnitude as to equal that of an ox. The right ventricle, indeed, had its cavity in a natural state, but the parietes of it were thicken'd very much; and the cavity of the left was so much enlarg'd, that it might have contain'd another heart, not larger than in the natural state; but the parietes of it, on the other hand, were so thin, that they seem'd scarcely to have been able to sustain the motion of the heart. With all this great capacity of the ventricle, the capacity of the great artery was not much less, so that this also might seem to belong to an ox rather than to the human body; but internally its membranous substance had degenerated into a cartilaginous one.

22. Intemperance in wine, even at that time, is an evident proof what course he us'd to follow before; and, without doubt, from thence had been the first cause of the disease: and indeed that very experienc'd physician Lancisi (*k*) testifies, that out of a hundred aneurisms which arose spontaneously, without any accident, more than fifty "had happen'd in gluttons and drunkards." But which of those diseases preceded, and which follow'd, is difficult certainly to determine: yet it is probable, that the dilatation of the aorta was brought on before that of the ventricle, from whence it rises; for when the ventricle was itself dilated with so great an extenuation of its coats, it does not seem possible that it should have driven the blood on with so much force into the artery as to dilate that; and the artery, when dilated, and at the same time cartilaginous, seems certainly to be so far incapable of propelling the blood quite into the veins, that it could, for this reason, admit only a part of the blood, brought thither by the ventricle, and consequently the remaining part must be left behind to stagnate in that cavity and dilate it, and from thence it would follow, that the blood must be obstructed in the lungs also; from whence those oppressions and tightnesses of the breast, and hence the increas'd secretions and discharges, from the glands opening into the bronchia, as also by reason of the remora of the blood, in the membrane lying about the heart, and the frequent strokes of the heart, which had long palpitated, a dropsy of the same membrane or pericardium arose.

23. A man of fifty years of age, whose daily business was to dress wool, in order to make beds of, began to complain of a difficult respiration, which was attended with a kind of whistling or wheezing; sometimes he was seiz'd with strictures of the præcordia, and tightnesses of respiration, which were succeeded now and then by a violent pain in the loins; the arteries in the neck had a violent pulsation: besides all this, a spitting of blood coming on, some days before death, with an extremely difficult and disturb'd respiratory motion, he at length died. In both the cavities of the thorax, serum was extravasated, of the colour of diluted blood; the inferior part of the left lobe of the lungs, and one lobule of the right lobe, were quite black, from the quantity of blood extravasated within their substance; the heart was increas'd in its bulk, but shew'd no signs of any polypous concretion in its cavities; the aorta, near the heart, was dilated into an aneurism, the internal parietes of which were cover'd here and there with bony scales; while a very flaccid cerebrum was taken out from the cranium, a small quantity of serum was discharg'd from

(*k*) De Aneurism. propos. 41.

thence, but a much greater quantity lay about the beginning of the spinal marrow; yet in the ventricles only a little. The extremely bad putrefecency, and smell of the body, prevented us from opening the belly, in order to enquire into the cause of the pain in the loins; although Valsalva, even then, imagin'd that the enquiry would be in vain, inasmuch as he rather suppos'd it was to be accounted for from nerves, that were, perhaps, elsewhere irritated.

24. If this pain had not been accusom'd to succeed the strictures of the præcordia and the tightnesses of respiration, at some times, we might perhaps be at liberty to suspect the cause of it to lie in that water, which, as it occupy'd the upper part of the vertebral tube in so large a quantity, must needs be suppos'd to have fill'd the lower part still more. or, at least as much. But now it seems rather, that it ought to be ascrib'd to the more vehement actions of the diaphragm, in endeavouring to carry on respiration, as this muscle is fix'd by one of its extremities to the vertebræ of the loins. But the dilatation of the aorta, in this case, I should chuse rather to ascribe to the very great force with which the heart, being increas'd in bulk, drove the blood forwards into it; and to the same cause the production of the bony scales seems to be owing, since Boerhaave (*l*) asserts, that those stags only have the beginning of this artery bony, who have exercis'd themselves with long and frequent running, and not those which are kept in the parks of gentlemen, and nourish'd at their ease. But as these things are to be ascrib'd to the very great force of the left ventricle of the heart, so this is to be imputed to the very great force of the right ventricle; I mean, that the blood having at length broken through its vessels, was effus'd into the substance of the lungs, that is among the vesicles, from whence it was discharg'd by spitting; and this effusion was so much the more easily made, because that viscus could not be quite sound and firm, by reason of the dust of the wool continually flying in with the air; and the dilatation of the aorta being suppos'd for some time, it is probable that the ventricles also of the heart were somewhat dilated from the stagnating blood; so that the encrease of bulk was owing not only to the thickness of the parietes, but likewise to the enlarg'd state of the ventricles. And the same you will suppose said of the next observation that follows.

25. A woman, of about sixty years of age, had labour'd a long time under a cough, and a difficulty of respiration, which was not continual, but most observable after violent motion. At length a pulsating tumour began to appear, under the right clavicle at the sternum; which, in the space of two or three months, increas'd to such a degree, that one head of it seem'd to have risen, as it were, out of the middle of the sternum; for it was extended from thence, almost in a globular form, to the neck. In the tumour was a sense of heat, and burning pain. In the mean while, those former inconveniences were much increas'd, and others were added over and above. For from the middle of the upper arms to the hands, and from the upper part of the legs, almost quite to the feet, her limbs were all over œdematous, which was so much the more remarkable, because, as the upper arms were much extenuated, from the upper part quite

to the middle, at that part, of a sudden, began this immoderate thicknes; which circumstance might also be observ'd in the legs, though not so evidently, when the upper parts of them were compar'd with the neighb'ring parts. The face also had swell'd a little. She had a frequent spitting, and on the last days it was almost purulent. The pulse was weak, and small. She had no rest, unless when she sat up: for any even slight motion, and not only lying down on her back, threw her into instant danger of suffocation. The same effect was produc'd from the taking of food, or drink; so that she was at length constrain'd to abstain entirely from both. Wherefore, having abstain'd six days, she was carried off, rather from being starv'd with hunger, and from slight convulsive motions, than from the disease.

In the belly, a limpid serum stagnated. The liver and the stomach were found to be plac'd lower than usual. The colon did not go from the right side to the left, but when it had touch'd upon the bottom of the stomach, it went from thence immediately, through the middle of the belly, to the rectum. The fæces of the belly, not having been discharg'd of a long time before death, were almost all contain'd within the beginning of the colon. A gland lay upon the left kidney, externally, of the bigness of a chefnut, and internally of a yellowish colour. In the thorax serum stagnated, which was drawn out with sponges. The left lobe of the lungs was very much contracted, and in a manner inflam'd, and in the middle contain'd a sanious ichor, and here and there little tubercles, some of which were suppurated. The pericardium abounded with serum. The heart, being plac'd somewhat lower than usual, and almost wholly in the left side, was twice as big as it naturally is, nor yet contain'd any polypous concretions. But the aorta had a large and oblong aneurismal sac produc'd from it. The orifice of this sac communicated with the artery, at the superior, and somewhat anterior part of its curvature, in such a manner, that the common trunk, also, of the right carotid, and subclavian, being dilated into that sac, these two arteries came forth from the posterior surface of its beginning. And as the sac became more wide, the more distant it was from the orifice. First, indeed, it compress'd very much the interior parts of the thorax, and among these the aspera arteria, and œsophagus: but after that, having consum'd away the anterior bones of the thorax, and especially the right clavicle, and such of the ribs as were nearest to it, and the parts of the sternum, by its continual pulsation, and by an eroding humour that was discharg'd therefrom, it had prepar'd a way for itself to the external parts, and raising up the muscles and integuments, had made that figure, as I call'd it, of another head. But these parts, which it had carried out with it, had, by lying round the sac, prevented the blood from being easily pour'd out from the ruptur'd aneurism. For the external coat of the artery, the more it receded from the trunk, being so much the more extenuated, could scarcely be any more known, or perceiv'd, when you came on the outside of the thorax. And the internal coat itself also, in the trunk, preserv'd its natural state; yet presently seem'd to consist even of three membranes, each of which seem'd to be subdivided into others, but pretty thick ones, and in a manner fleshy, and which, if they had been more firm, would have almost represented a muscular body, the tendon of which was to be suppos'd in this internal coat, where it came out

out from the trunk. Nevertheless, these fleshy kinds of membranes, which made up the internal coat of the sac, and which, in some places, were equal in thickness to a finger's breadth, in other places were lacerated, and eroded; so that unless either the external coat, or the parietes of the parts that lay round about, had prevented it, the blood must have burst forth from thence. As to what remains on this subject, a grumous blood was contain'd in the cavity of the sac.

The limbs, also, that were œdematous, were dissected; and no serum was found betwixt the muscular fibres: but the whole of it seem'd to be shut up betwixt the skin and the muscles, in the dilated cells of the adipose membrane. And it was easily suppos'd, that in those parts of the limbs, which I spoke of, this serum had stagnated, by reason of the impulse of the blood through the arteries being debilitated, and for that reason not able to carry it upwards; for, certainly, those parts of the limbs that were nearer to the heart, by no means swell'd, as I have already said. This serum being press'd out from the arm, in many places, by the incision of the skin, resembl'd water in its colour; and when put upon the fire, did not at all become turbid, but evaporated away wholly. But that which had been taken from the thoracic cavities, approaching in its colour to a saturated yellow, not only became turbid, but a little after had a pellicle upon its surface, which, as the evaporation constantly went on, it at length left in the bottom of the vessel.

As to the serum that was drawn out from the belly, although it was like the first in colour, and although it evaporated away in the same manner as the second, yet it by no means became turbid. Moreover, as a portion of each was not committed to the fire, but kept separately in glass-vessels, and although the second, in a short time, shew'd many concretions of a membranous form, swimming in the middle of it, like those which frequently appear in wine, yet the first and third exhibited very few only.

26. Many things in this history are worthy of remark, whether we consider the woman as living, or as dead. And this, in particular, in the living body, that not only from violent motion she fell into danger of suffocation, as most other persons who labour under aneurisms do, but even from any slight motion, and from the taking of food and drink. I never remember to have seen symptoms more like these, and others, that are describ'd in this woman, than in the month of October, in the year 1705, when I attended as physician upon the most excellent marquis Aloysio Palucci, who was commander in chief of the pontifical forces, and related to three most eminent cardinals of the holy church of Rome, of the same name, that is, to one as his brother's son, to another as his brother, and to a third as his uncle; a man who deserv'd a much longer and happier life. For by reason of a disease of this kind, he could neither lie down, nor go to stool, nor make water, nor even swallow nourishment, but almost immediately a paroxysm was brought on, which threaten'd instant suffocation, and sometimes almost death itself. For he us'd, sometimes, to leap suddenly out of the seat, on which, to avoid all motion, he continually sat, and run to the window with hopes of breathing better there; yet, nevertheless, he us'd to draw his-breath with a stertor, to be livid in his whole face, to discharge his urine and fæces involuntarily, which circumstances, and others of the same kind, very frequently

quently happen'd. But sometimes the stricture upon his breast was so great, that his breath being quite intercepted, he could no more even snore, but fell forwards, just like one that was dying, upon the arms of the servants, that supported him on each side; and when at length he began to recover from so great a danger, and sometimes perhaps ask'd for the chamber-pot, in vain would he then attempt to make water, by reason of the penis being drawn inwards in an almost incredible manner. I was much chagrind, that, before he sunk under his inevitable fate, I was under a necessity of returning out of my native place into Bologna, in order to preside, in virtue of my office, at the first meeting of the illustrious academy, now call'd *Accademia Instituti Scientiarum*. For owing to this necessity, it was not in my power to examine thoroughly, by dissection, the disease, which I had distinguish'd from a few others, that had somewhat similar symptoms, by thinking, and comparing them together; though, indeed, there was no doubt, but that an aneurism, of the bigness of a kid's head, was found at the curvature of the aorta, on dissection, by which the œsophagus, and still more the canals of the aspera arteria, were compress'd: for that even the physician of this nobleman expressly confess'd, who, though in other respects learn'd, had before referr'd, in conjunction with most others, whatever the patient suffer'd, to convulsions; for this reason particularly, which, as is demonstrated by the celebrated Pasta (*m*), has oftentimes impos'd upon others, or might have impos'd upon them, that it does not seem possible, but the effects must be perpetual from such a perpetual cause as an aneurism is. But as to pointing out more clearly the situation of this aneurism, and whether it consisted in a simple dilatation of the aorta, or in a sac, and other circumstances of that kind, I should have been able to have done this with certainty from the dissection, but I am not able to do it at present.

27. For I do not doubt but you will remember, that aneurisms were formerly divided by me (*n*) into these, which a vessel equally expanded on all sides forms, and those which grow out from the side of the vessel, like a bag, and that my division was approv'd by those very learned men Schreiberus (*o*) and Valcarengus (*p*): and that from the sac, being plac'd after this or that manner, a reason was easily given by Littre (*q*), and by Boerhaave (*r*), why swoonings, or suffocations, should frequently attack the patients, from a change in the situation of the body, the blood, for instance, sometimes falling down in so large a quantity, into the fundus of the sac, which has a great declivity, that there does not remain enough in the arteries to carry on the circulation, and sometimes falling back into the opposite part of the sac, in such a manner, that the bronchia, if they are near at hand, are very considerably compress'd, which happen'd in the woman, whose history I have just given you. However, whether there was, or was not, a sac of the aorta in Palucci; there certainly was such a dilatation, that when it lay on the aspera arteria, as it did in the supine posture of body, that tube was greatly compress'd by it, and so much the more, as the more

(*m*) Epist. de Cord. Polyp. n. V.

(*n*) Advers. 2. Animadv. 39.

(*o*) Act. Erud. Lips. A. 1731. M. Aug.

(*p*) De Aortæ Aneur. Obs. 1.

(*q*) Mem. de l'Acad. R. des Sc. A. 1707.

(*r*) Prælect. in Instit. § 826.

blood was obstructed there, which would of course encrease both the expansion, and the weight. And that the blood was accusom'd, even on the slightest motion, to stagnate there, both in him, and in the woman, was prov'd from the swallowing of nourishment; by which action the aneurism, that was near to the gula, could be but very little press'd upon, or agitated. In this manner, some effects of an aneurism may not be perpetual, though the aneurism is itself indeed perpetual, but not always equally dilated, or grievous. And from this you understand, that if any slight internal cause happen, or any other that is but little attended to, as for instance, flatulles endeavouring to escape by the œsophagus, or accidental compressions of the limbs, and consequently, some of the vessels, resisting the blood, and for that reason somewhat retarding its motion in the aorta and aneurism; they may certainly, in patients of that kind, give occasion to the most violent paroxysm; and on the other hand, if the vessels of the limbs are opportunely relax'd, when the blood begins to stagnate in the aneurism, its motion may sometimes be so expedited, that the paroxysm may be intercepted in the very beginning. And both these circumstances happen'd in Palucci. For sometimes no reason appear'd, why he was taken with a paroxysm. And at other times, those that were now threat'ning, and even begun, were artificially suppress'd in this manner. From the very beginning, when the disease, being yet obscure, lay under the deceitful mask of periodical pains, that wander'd through the left shoulder, and the adjacent parts, the patient experienc'd great ease, from the immersion of the arm and hand on the same side, into water that was pretty hot.

But from the time that the disease began to discover itself, by other less ambiguous marks, and those suffocating paroxysms, which I spoke of, in particular, he call'd now and then, in the progress, or declension, of these paroxysms, for the same kind of water, that he might only wash his hands and forehead with it; and he affirm'd, that he was always somewhat eas'd from thence, even more than by any other kind of remedy whatever. Then I, who saw the patient in those first days, and heard these things, said to the other physicians, why do we not rather prevent the paroxysm, when it is coming on, by this very same method? yet not only by washing the hands, but bathing both them and the arms in warm water, quite up to the elbow; and if the event succeeds according to our wishes, by holding them so long in the water, till all signs of an approaching paroxysm entirely vanish away. As the other physicians did not dissent, and the patient, in particular, was willing to try it, the experiment was made with such success, that notwithstanding his paroxysms, some slighter, and some more violent, had been very frequent on the three foregoing days; yet on the day in which we made this experiment first, which was the seventh of October, and on the four following days, no attack could appear openly; for although many began on the seventh day, in particular, yet all of them were immediately repress'd by this method. And notwithstanding there happen'd two on the following days which could not be check'd by this method, yet some others, and amongst these, one very violent paroxysm, which began on the fourteenth day, were repress'd thereby; and you may take my word; for as long as I attended the patient, I very attentively and accurately observ'd whatever happen'd

happen'd, and on what day it happen'd.* And I wish this method had been sufficient to have prevented them all, as it certainly did prevent those I have mention'd, and that not with less joy to the patient, than if you had so many times freed him from instant death.

The same kind of remedy I afterwards us'd, adding frictions of the arms, while they were immers'd in the hot water, with great advantage in two virgins, whom a vehement anxiety at the præcordia in one, with a sense of suffocation, and in the other, with a total suspension of all the senses, had seiz'd at different times. For the latter of them I rous'd in this manner, and soon put a stop to the attack, which otherwise, according to custom, would not have been short; and the former found, at least, some alleviation therefrom. And not to digress from those, in whom it was certain, that there was an organical injury, about the præcordia, and for that reason, frequent anxieties, with a difficulty of breathing, though it was in no person's power to remove the disorder, yet I have render'd the symptoms of it, at least, so slight, by the same easy remedy, and that in so short a time, especially in a noble Venetian, that all who were present were astonish'd. But even in the case of a most serene prince, to whom, when lab'ring under a like distemper, I was call'd, for the sake of consulting with other physicians, I did not doubt to propose the same remedy, with the same hope: although the physicians, who, as I return'd immediately to Padua, to continue my office of teaching, presently pronounc'd that death was at hand, neglected to make use of this remedy, being so much deceiv'd in their prognostic, that this excellent prince surviv'd many months, under the care of other physicians, as I had said might happen. And since internal convulsions frequently bring on anxieties of that kind, as in those virgins, and frequently also, as in the others who have been taken notice of, may be join'd to an organical injury, and thus accelerate the coming on of the attacks, and encrease their force; therefore, if you would refer the utility of frictions, in warm water also, to some revulsion of the motions, and that of the immersion therein, to the relaxation, which is propagated from the limbs to the viscera, just as cold, by a contrary action, extends itself from the feet inwardly, in such a manner, as frequently to bring on cholic pains; I shall not only not be against it, but even very much approve it, if you transfer hither what the illustrious Archiater Senac (s) has taught, relating to the manner in which frictions, and in like manner warm baths to the feet, have often alleviated palpitations of the heart. But let us return to the woman diseased by Valsalva (t).

28. As to the situation of some viscera being chang'd, which he observ'd in her body, there is no occasion to say much upon this head here. For that the colon does obtain the situation which he has describ'd, and not very seldom neither, from the very original formation, I have not only admonish'd in a former work (u); but you may also gather, from some of the foregoing letters, and from some of the future. But the liver and the stomach were push'd lower than usual by the heart, itself being also thrust downwards, not only by its own weight and bulk, but also by an aneurism

(s) *Traite du Cœur* l. 4. ch. 11. n. 19. (t) *supra*, n. 25. (u) *Advers. 2. Animad. 2.*

of the aorta, by which it was driv'n even to the left side: nor could the heart have thrust down those two viscera, without, at the same time, driving the diaphragm downwards, which lay betwixt them. And that this might justly and deservedly be call'd the prolapsus of the heart, I have already said in the *Epistole Anatomicæ* (x); and by this name I would also willingly call that which is describ'd by Pacchioni, in the first and in the second history (y); for I have, without injustice, rejected some others, which have been propos'd by other persons frequently, for this reason only, because they do not seem to have observ'd, that the heart naturally lies upon the diaphragm: nor indeed do I see, that Valsalva has ever fall'n into an error of this kind. But in the true prolapsus of the heart, the diaphragm is sometimes so far depress'd, that it extends itself downwards, into a kind of a hood, in which the heart is embrac'd, as the French king's physician, whom I have already commended, saw in the *Marquis du Palais* (z). But as the diaphragm and heart descend more or less, so the inconveniencies of a compress'd stomach, and the pulsations of the heart, in the left hypochondrium, are more or less observ'd, as the histories of Pacchioni confirm: wherefore, not the patients only, but the physicians, who do not consider all the symptoms accurately, may take a disorder of the heart, and the pulsations thereof, for a disorder of the stomach, and the pulsations of the coeliac artery. And it has frequently happen'd, that from a like compression of the diaphragm, those who are affected with a dropisy of the pericardium, have complain'd of pain, and weight, oppressing the region of the stomach. You must not, however, wonder that Valsalva has not made mention of any complaints in the stomach, or pulsations about that region, in this woman. For the heart had descended only a little lower than usual in its situation: and besides, on the last days that he seems to have seen her, the patient had so many other more violent symptoms to complain of, that she might easily have pass'd them over, as the more slight, which generally happens; not to say any thing of the pulses of the heart, which at that time were certainly small, and weak also, as is generally the case in a long and very troublesome disease, and in this, that brought the patient to the last necessities of hunger, might easily happen.

29. However, we must allow to Valsalva what is to be allow'd to many others, to wit, that at the time he made this observation, what were in fact polypous concretions adhering internally to the membrane of the aorta, and resembling flesh, might seem to him to be the real substance of the coats of the artery, although Harvey (a) had admonish'd, that flesh of this kind did not belong to the coats of the artery; and some believe him to have been the first who mention'd this in his writings. But you will find in that very observation which I have more than once commended above (b), as the first which was made by dissection, on the aneurism in the trunk of the aorta, that the blood "was contain'd in a kind of concreted cruor or flesh-like matter, destitute of fibres, which was again surrounded by a kind of whitish and hard substance, of the thickness of a finger's breadth, in colour and appearance not unlike

(x) XV. n. 53.

(y) *Oper. Edit.* 4. vers. fin.

(z) 1. cit. ch. 8. n. 4.

(a) *De Circulat. Sanguin. Exerc.* 3. five ad*Riolan.* 2.

(b) n. 3. & 18.

“hog’s lard that has been melted.” And when you read this, I would have you attend not only to what was evident, that this concretion was double, but also whether it seem’d to be continu’d all round; and I would have you attend to the same things, not only in that delineation which was, without doubt, the first of a dissected aneurism of the aorta, and which is from Riva (*c*), but also in that more full description which Ruyfch gave (*d*) of the innumerable “fleshy” coats, or rather concretions, that being dispos’d “in lamellæ, as it were,” made up the aneurism. I pass by other observations that were publish’d afterwards, in some of which, as in that of Valsalva, both of those circumstances I have mention’d, you will easily find did exist. And if this is so, as certainly it frequently is from my observations, especially in these aneurisms which hang like a bag from the artery, I hope it will be by no means displeasing to a very learn’d man who is much my friend, if I persist in my opinion of considering these concretions, at least, which were formerly describ’d also by me (*e*), as a polypus form’d before death. Nor indeed am I us’d to find them sometimes in this region, and sometimes in that region of the body, according to the different posture thereof after death, but even plac’d every where all round in an unmov’d carcase, and adhering to all sides, and those of a certain lurid colour, not yet entirely deprav’d, and of a substance immoderately dry; so that, inasmuch as they differ greatly from all those which I ever saw in the ventricles of the heart, so much the more do they shew that they were not recently produc’d, as these were, nor yet simular, as these are, in all at least that have ever occur’d to me, to blood, that is examin’d after having stood in a glass vessel a day or two to coagulate, but far differing from this, both to the touch and to the eye. They do not, however, occur in all aneurisms, notwithstanding the blood be thick and viscid, and the surface of the artery unequal, the breadth much greater, the parietes weak, and, finally, every thing so dispos’d, that from the motion of the blood being doubtless diminish’d, it seems that these depositions and adhesions must of course easily take place; and even putting the aneurism quite out of the question, when the artery has been very closely tied up in living dogs, yet a polypous concretion did by no means appear above the part that was tied, as it had appear’d to Lancisi (*f*). Yet I do not only readily give credit to this gentleman, who by reason of his ingenuity, his diligence, his doctrine, and his friendship towards me, is very dear to me; but, moreover, what he contends for, in regard to some kinds of aneurisms, I even confirm by some of my observations, and by a great number of Valsalva’s. However, as I confess that innumerable other polypi, which most physicians have suppos’d, with too great readiness, to have existed in the living body, were justly call’d into dispute by him; and as I do not know any person who has reason’d more nervously on the whole of this subject, and deserv’d better of the medical faculty in this respect, so I should believe that some very few polypi, out of so great a number, may be excepted, and especially those which are found where the motion of the blood has either been wholly destroy’d, or very much impeded. For what has been found by Lancisi in dogs, has also been found by others in

(*c*) Eph. N. C. Dec. 1. A. 1. Obs. 18.

(*d*) Obs. Anat. Chir. 38.

(*e*) Advers. 2. Anim. 41.

(*f*) De Aneur. Propos. 38.

men, as by the very experienc'd surgeon Petit (*g*), who describes and gives a figure of a polypus in the artery of those who had their limbs amputated, form'd above the ligature; and he says, that this was not only found perfect, in general, after the twentieth or thirtieth day, but even after the second day from amputation. But if the motion of the blood be not, as in that case, altogether obstructed, but only very much retarded, as in a large aneurism, it seems to me very difficult to suppose, in many cases, that no part of the blood, at least in a long space of time, should at length separate, concrete, and adhere, as it certainly flows on very slowly in that part, or even as in those aneurisms which have the form of a bag, almost stands still: for through the same orifice of the sac into which it is easily impell'd, or falls, it cannot so easily and totally return; which circumstance is plac'd by Littre (*b*) among the causes retarding the motion of the blood; but I do not know whether it be the chief of them all or not. What if with this, besides the other general causes, almost perpetual quiet is join'd, by reason of the patient fearing either a syncope or suffocation, as is for the most part the case, in the latter part of the disease? And if, even in this manner, no polypi were, perhaps, generated before death, in any particular instance, I should think that a peculiar cause lay latent in that man, by reason of which they could not even be generated after death, or, at least, could scarcely be generated. But these things I will leave to the determination of others, and particularly to the judgment and decision of that very celebrated man, whom I deservedly love and commend.

30. Before I make an end of writing upon aneurisms, which were found from dissection in the aorta, much more frequently by Valsalva than he could have believ'd, I do not think that I am at liberty to pass over, entirely, in silence, that being mov'd by the very great frequency of so fatal a disease, he began to think how it would be possible, by counter-acting it in the beginning, to prevent its increase and progress. This method of prevention, or cure, is made public by Hippolyto Francesco Albertini (*i*), the companion of his studies, which if you read over, you will immediately think with me, that no other person certainly ever existed who executed with so severe a diligence, what Hippocrates (*k*), in regard to the internal varices of the veins, which I spoke of above (*l*), had commanded formerly after this manner: "But it is of use in such persons, if you undertake to cure them in the beginning, that blood be taken from the veins in the hand, and that the diet be as dry as possible, and as little apt to generate blood." But the advantage was equal to the severity of the regimen; for as to what Hippocrates subjoins, "if they are cur'd in the beginning of the disease, the veins in the side again subside into their places, and become low," the very same thing happen'd in the arteries, from the same method of cure being timely apply'd. Nor did Valsalva know this from the departure of the pulsation, and the other signs only which attend upon an incipient aneurism, but he also made use of his own eyes; for a nobleman whom he had cur'd in this manner, having died afterwards of another disease, he found the artery, in which the aneurism had

(*g*) Mem. de l'Acad. R. des Sc. A. 1531.

(*b*) Mem. A. 1707.

(*i*) Opusc. cit. supra, ad n. 5.

(*k*) De Morbis l. 1. n. 10.

(*l*) n. 1:

been beginning, contracted again to its natural size, but in a manner callous in that place. This case, indeed, Valsalva omitted to write down, as he did many others in the latter years of his life; yet he communicated it to several persons, and in particular, to that excellent physician Anthony Stancario, a man, if there is one in the world, of undoubted credit, from whom I myself receiv'd that which I have related and what I shall subjoin, when I came from Bologna in the year 1728.

When Valsalva had taken away as much blood as was requisite, and had done the other necessary things which Albertini has since describ'd, he made it a custom to diminish the quantity of meat and drink more and more every day, till he came so far as to allow only half a pound of pudding in the morning, and in the evening half that quantity, and nothing else except water (and this also within a certain weight) which he medicated with what they call the ice of quinces, or the lapis osseo colla ground down into a very fine powder. After he had sufficiently reduc'd the patient by this method, so that he could, by reason of weakness, scarcely raise his hand from the bed, in which he lay by Valsalva's order, from the very beginning of the disease, he encreas'd by degrees, every day, the quantity of aliment, till the necessary strength return'd, in order to rise. And Stancario added this also, that he himself having successfully cur'd a young nun in the same manner, on the first days that she rose from her bed, according to the regimen given us by Albertini, the pulsation return'd; but that we ought not to be terrify'd at this, for it did not continue, but at length vanish'd away entirely, nor did any more return; nor will it in general return, unless, perhaps, the patients will not restrain themselves within moderate bounds of living: for a young doctor who would not live regularly, had the pulsation taken away by Valsalva, by this method of cure, in vain; for the pulsation return'd again, and with that the disease, which at length carry'd off the patient.

These things, if you please, you may add to what Albertini has said on the same subject, and in the mean while observe with me, how far from the method of Valsalva, who suffer'd water to be given, only under proper restraint, is the advice of those who have recommended the drinking of warm water from baths to those who are affected with this disease; and, on the other hand, how near that method of cure approaches to Valsalva's, which was happily made use of by Bernardin Genga (*m*), and John Maria Lancisi (*n*), with justice confirm'd, in order to restrain external aneurisms in the very beginning; so that if Hippocrates, as is hinted at above, had not, in some measure, pointed out the way, this might seem to have been transferr'd by Valsalva, from external to internal aneurisms.

31. I am not ignorant, that there will be many to whom the method of cure which Valsalva us'd may seem much more insufferable than the aneurism itself, especially at that only time when it could be of use; for the slight inconveniences in the beginning, and the danger which is not yet at hand, and is unseen to the patients, suffer them to flatter themselves, though they must of course feel far otherwise, when the disorder shall come to such a height, that neither the most grievous and continual

(*m*) Anat. Chirurg. l. 2. c. 24. (*n*) De Mot. Cord. & Aneur. l. 2. c. 1. Prop. 11. in fin.

uncasi-

uneasinesses, nor death itself, which is every hour impending, can any longer be avoided, by any kind of remedy whatever. They who would not endure that parsimony in their food, while it could be a cure to them, are sometimes oblig'd to suffer the most extreme hunger, as the woman I speak of (e) did, which does not bring health, but rather death, inasmuch as it really accelerates it, to a very weak and exhausted body. And by reason of the same infirmity, and the little quantity of blood, venæsections, which, if timely made use of, would have been advantageous, are now prejudicial. On the other hand, how much those remedies, and that parsimony, can do in the beginning, nothing better demonstrates than the utility of both, which is well known to physicians, if they are even moderately made use of, to retard the progress of an aneurism that is already form'd, yet not too far advanc'd. But I saw an old woman at Bologna, who had been taken into the hospital for a violent inflammation of her eyes. As I perceiv'd that her pulse was full, tense, and chord-like, and saw that the arteries in her neck leap'd to a considerable degree, especially the left, which was swoll'n into an aneurism, not far from the larynx, equal in size to a walnut; I enquir'd whether this was a recent, or an old complaint, and had this relation made to me, which I make to you: That this tumour, which I observ'd in the neck, had come upon her about nine years ago, after she had wearied herself for two days together by continual fatigues. And having shewn it to two eminent physicians, they both of them pronounc'd it to be, what it evidently was, an aneurism; but that each of them had given a different advice: for that one had order'd her to lose blood every two months: the other not to lose blood, but rather to use a spare diet, and other things of that kind; adding this reason in confirmation of his opinion, that he had known a man, who, while blood was flowing out of the vein that had been open'd, had his aneurism burst at the very instant; which, whether it happen'd by accident, the parietes of the aneurism, for instance, being already extenuated, and half lacerated, and a rupture of itself being at hand, or whether the rupture was, perhaps, somewhat accelerated by the impetus of the blood being a little increas'd upon the very thin parietes of the aneurism, while the blood flow'd out from the vein, may certainly be added here to the other causes, as a reason why, in the latter part of the disease, or when there are already signs of a rupture being at hand, no tumult is to be excited by the physician, especially as, besides Ballonius (p), I am not ignorant of another example, which will presently be subjoin'd: yet it ought not to prevent that most useful remedy of blood-letting in the incipient and progressive state of the aneurism. For this remedy was very useful to the woman I have been speaking of, although she was too fond of the practice. For having follow'd the advice of the former physician entirely, but having detested to such a degree the advice of the latter, which the former would certainly have approv'd, so that she committed all kinds of errors and irregularities in her diet, such as either occasion threw in her way, or appetite suggested to her; yet for those nine years together, she bore what I have describ'd in her neck, without the least increase, although palpitations of the heart were, indeed, sometimes brought

(e) Supra, n. 25.

(p) Vid. n. seq. in fin.

on. But it is dangerous to imitate this woman, unless any one should, perhaps, generate so much blood as she generated. For besides that quantity which she lost every two months also, a year before I saw her she had brought up from her lungs such a quantity of blood that she was reduc'd to the last extremity, yet did not fall into a cachexy, but even, as I said, labour'd, at length, under an inflammation of the eyes.

32. Now take the other example, which I promis'd just now; an example not very much unlike that which the physician related to the old woman, if I am not deceiv'd. A nobleman, aged more than fifty years, about the beginning of May, in the year 1730, came to Padua, to consult me, and at the same time, to consult another senior physician. He told us, that from the very time he had repell'd an eruption of the scabies-kind, that had come upon him for the second time, by a sulphureous ointment; from that very time, I say, and it was now ten years since, he had been, by degrees, subject to a certain troublesome sense of weight, and constriction, just as if a large bolus stuck in its passage through the œsophagus: that this sensation seem'd to be situated in the internal part of the thorax, opposite to the middle region of the sternum, except that sometimes, though but seldom, it was extended so far as to correspond with the lower part of the sternum; and at that time his respiration was also somewhat injur'd, and a very heavy kind of stupor was diffus'd through each of his superior limbs: and that in the beginning, indeed, he had felt this sensation only when he walk'd, especially up steep places, but afterwards when he bent himself forwards also, and remain'd in that situation: that it very seldom attack'd him in the summer, or before dinner, but much more often in the winter, and after dinner, and when he was going to bed: that, for the most part, it vanish'd soon, if he stood upright; but in the last winter, when it had awak'd him out of his sleep, which never had happen'd before, that it continu'd two or three hours, although he had risen out of bed. However, he neither perceiv'd any pulsation, nor had an intermitting pulse; yet his pulse was very frequent and chord-like, that uneasy sensation not being entirely gone off, when I enquir'd into their state; at which time also, by pressing the hand closely to the left nipple, the heart seem'd to beat a little stronger than was natural. And as we found no disorder in any place, but those which are spoken of, and especially that there was not the least trace of a cephalic, or hypochondriac affection, we both of us began to suspect, that the irritating and corrosive particles of the scabies, which had been repell'd, had not so much fall'n upon a ganglion, or any plexus of nerves, which go to the præcordia, as perhaps upon the coats of the aorta, and brought on a tendency to dilatation.

Notwithstanding we here gave our opinion in a case that was not quite clear, yet we did not think venæsection should be omitted, because we believ'd, that, if it were of no advantage, it could be of no injury, inasmuch as he was a man of firm strength, of a good habit of body, and had a florid complexion from his youth; that it could be in no respect injurious, even whether the disease was from contractions of the nerves, or from a dilatation of the artery, but certainly, as it was then the spring-time, would be particularly useful. And I remember I inculcated this upon him, when he

was going away, that if he found the loss of blood of service to him, he should take care to have it repeated, before the end of the spring; but if he observ'd himself to be disturb'd, or weaken'd by the first, he should omit it, and that he should do the same also in regard to other remedies, one indispensible remedy only excepted, which we earnestly recommended a compliance with; I mean, a proper use of what the physicians call the non-naturals. Wherefore this nobleman having reach'd his home very happily, which was not at a great distance, and having begun to use the first and most innocent remedies, and at the same time having lost eight ounces of blood from his right arm, his physician thought proper that he should lose blood again, for this reason, because it was, as he said, hot and inflam'd, at least black, and very viscid.

But when the fourth day was come, on which the physician had order'd the blood to be taken away, the patient was not willing to comply, perhaps, in consequence of the admonitions I had given him, and objected to it on account of the debility which he said he perceiv'd; and indeed, on the two preceding nights, he had been a little troubl'd with his disorder. Yet as this weakness had not destroy'd his usual chearfulness, nor taken away the power of walking, nor, as the surgeon affirm'd, the vigour and strength of his pulse, at length, overcome by his persuasions, he gave his foot to him, in compliance with the physician's order, from which six ounces of blood, and no more, were taken. No sooner was this done, but the nobleman cried out, that the surgeon had kill'd him, and was seiz'd with a fainting-fit, and presently, when he recover'd from that, with another, and at length, having of himself got out of bed, for the sake of going to stool, with a third, and being at the same time taken with his former disorder, he could be no more recover'd, wherefore he died, in an easy placid manner, on that very day; that is, about the twentieth day after his departure from Padua.

As most persons of the city, where this nobleman resided, inveigh'd against the physician and surgeon, according to custom, as having injudiciously, and without reason, taken blood away on that day, and thereby brought on the immediate death of their noble patient, and as I was consulted on this subject by letters, I inform'd them, what frequently happen'd in a disorder of that kind, which we suspected this nobleman's to be, even without any blood-letting being administer'd; and by this means we appeas'd their resentments against them. And this they themselves would have done much sooner, in my opinion, if they had been at liberty to open the body after death, by showing that the cause of death did not arise from the blood that had been taken from the vein externally, but from that which had certainly flow'd from a vessel that had been ruptur'd internally: notwithstanding Bal-lonius, to whom an almost similar circumstance happen'd; to wit, that Formageus, whose aneurism I have mention'd above (g), "died suddenly from "the rupture of it, three hours after venæsection," did not deny that this had happen'd to him, "to the great reproach of our art, which is so useful "to many," and even acknowledg'd, "that it was a shameful calamity." But he who had taken the disease for another, could not have prevented the

reproach: yet the physician and surgeon of the noble patient I have been speaking of, might have consulted their own reputation better, beforehand, both from our suspicion, and from hearing what I had inculcated on the patient.

However, the case which I have here describ'd, ought to be a caution to all practitioners, not to compel patients to admit of any remedy, to which they are utterly averse, especially in obscure diseases, whether the remedy is of great importance, or has the appearance of being so. In the mean time farewell, and expect my observations upon aneurisms, confirm'd by anatomy, in the next letter.

LETTER the EIGHTEENTH,

Which concludes the Discourse upon injur'd Respiration, from Aneurisms of the Heart, or great Artery, within the Thorax.

1. **N**OW take also my observations of internal aneurisms in the thorax, digested in the same order which I pursu'd in the last letter, in regard to the observations of Vallalva; so that whether they have place in the heart, or in the great artery, or, finally, in both places at once, you may equally understand from thence, that a lesion of respiration, which is the subject I treat of, had exist'd.

2. A shoemaker, of three-and-thirty years of age, having been liable to a difficulty of breathing, for a few years past, which us'd even to trouble him, when he was sitting down, as shoemakers generally do, and to a kind of slight faintings, his pulse being at that time unequal, but not afterwards, sometimes also to vertigoes, but chiefly to the other symptoms, which I mention'd just now, as I heard from the physician, who had attended him a twelvemonth before; finally, about the middle of January, in the year 1739, after having, in the morning, gone up all the stairs into the hospital, which are in great number, by himself, and being taken immediately into bed, he pointed out both by his words, and by his hand, a pain in the region of the diaphragm; he cough'd, he had a languid and somewhat frequent pulse, but it neither intermitted, nor was in any respect unequal. When death did not seem to be very near at hand, he threw up, from his stomach, a greenish kind of matter, and within half an hour, from the time that he came into the hospital, died. Examining the carcase, when it was brought into the theatre, in order to begin my anatomical demonstrations from it, I found that it so far seem'd of a laudable habit, as not to have any oedematous swelling upon the legs and feet, notwithstanding it was a little blotch'd with

a kind of scabies, and defac'd, as it were, with the colour of a cachectic person.

The abdomen being open'd, in which a little bloody serum was extravasated, a great part of the small intestines was found to be of a reddish colour, degenerating into brown; and the colon, to a very considerable extent, and particularly where it passes over from the right to the left hypochondrium, was so contracted, that it did not greatly exceed the thickness of a thumb. The stomach was also contracted, and internally mark'd here and there, with inflammatory striæ, and especially in the rugæ, the upper orifice being already livid, and almost black; it contain'd also a little quantity of yellow bile, which, notwithstanding it appear'd in its vesicle to be almost black, had nevertheless ting'd the external coats of the gall-bladder, and the neighbourhood thereof, with a deep yellow colour. The spleen was thicker than is natural, but found, and was connected very strongly, by its whole convex surface, to the diaphragm. What struck our eyes, above other things, was the smallness of the aorta, which, from the diaphragm, quite to its division, was more suitable to a little woman, than to a man, who was, like him, rather of a large stature: and this smallness I should perhaps have accounted for from this reason, that the aorta did not here, as usual, pass under the arch of the appendages of the diaphragm, where they are united into one; that is to say, they did not pass through a large interstice, but only through a foramen to the belly; if this foramen had not been of its accustomed breadth, and of the length of two inches. But that I may not seem to be obscure, in a circumstance which I do not remember ever to have met with, among other authors, take this account of it: that interval, which I just now pointed out, being left from the upper part of the arch, downwards and backwards, a tendon was drawn from the internal side of the right appendix, into the internal side of the left, to the length of nine lines of Bologna (*a*), and the thickness of one: and so between this tendon, and that arch, the aorta pass'd through to the belly. These things, and others, which it is of less consequence to take notice of here, being consider'd, when the vena cava was cut into, where it goes out from the liver to the diaphragm, a great quantity of blood issu'd out, in so black and thick a state, that it adher'd to the sponge, rather than was absorb'd by it, and ting'd the sponge like ink. Nor did I find that a less quantity of the same kind of blood, had issu'd out from the same vein afterwards, when on the tenth day, which from the time of his death, was the thirteenth, having demonstrated all the viscera of the belly separately, and in order, I return'd to the body in general, which in that cold season, had not contracted the least putrescency.

The thorax being open'd, we found, in both of its cavities, a limpid water, yet not in great quantity; and the right lobe of the lungs was connected to the pleura, almost in every part, but the left only in one part. Both of them were turgid, but neither of them heavy, nor yet in the bronchia, nor the other vessels, nor in the substance of the lungs itself, in any respect morbid. This only was observ'd, that the substance of this viscus could not be torn asunder, or broken from the bronchia, and the other ves-

(*a*) Vid. Valsalvæ de Aure Hum. Tab. 9. ad *

fels, without much more difficulty than usual. So also, soon after, in pulling away the external coat of the aorta, a greater resistance, than usual, was found. But at the division of the aspera arteria, into the first bronchia, the bronchial glands not only appear'd in great number, but were so thick, as to equal the magnitude of small grapes.

In the pericardium was a small quantity of reddish water; and the heart was more large than if you should even join two hearts into one; and both the auricles, and the sinus of the pulmonary vein, as it is call'd, were larger than usual; but the ventricles, and especially the left, were much larger than usual; for this latter cavity was so extended in breadth on all sides, that the diminish'd thickness of all its parietes was scarcely equal to the thickness of that paries which is proper to the right ventricle; yet those muscular chords which are interwoven within the right ventricle in a reticular manner, were not broken asunder for that reason, nor yet wasted; nor was there any evident disorder in the valves, except in those which are plac'd at the mouth of the aorta, for these we saw very lank, and contracted into themselves, somewhat rigid also, and a little hard, and that particularly in the upper border of each; but as there was only a small quantity of the blood which I describ'd above, in the beginning of the aorta, there was more in the left ventricle; and the same had so fill'd the branches of the coronary vessels, which pass through the heart, that a greater number of their lateral anastomoses appear'd to the naked eye than usual; and though the aorta, as well as the vena cava, was not particularly dilated in any part, yet it shew'd no slight disorders in its whole trunk, and those the greater, as it approach'd nearer to the heart. For as it was so variegated internally with large whitish spots, or, in other words, with the beginnings of future ossification, that it had a natural appearance only in few, and those small, places; the farther it ascended into the thorax, the more this appearance of disease encreas'd, so that before we came to the left subclavian artery these spots more evidently approach'd, up and down in its substance, to the nature of bony scales. However, there was nowhere any bone, not so much even as betwixt the heart and that orifice which is common to the right subclavian and carotid; in the whole of which extent, the artery was internally pale, and in many places of an unequal surface; which appearances it also shew'd even behind the semilunar valves. But in the whole of this tract, which I just now mention'd, there was such a hardness of the parietes, that they could scarcely be cut asunder by the knife, when apply'd with great force; and in these sections, the substance appear'd of a middle nature, between cartilage and ligament.

At length the cranium was open'd; but if we except the veins of the dura and pia mater being turgid with black blood, with which kind of blood most of the sinusses also, that those vessels open into, were distended, there was nothing at all worthy of remark, as in the ventricles of the cerebrum itself no serum was extravasated, nor yet any other morbid appearance was seen.

3. I have told you at large what I saw, and would have told you other things in like manner, if I had seen or had known them for certain; I mean those symptoms which had preceded in the last months, or at least in the last days: and there had preceded probably such causes as could irritate the stomach and small intestines, as the appearances in both of these parts, and the

vomiting of green matter, may indicate, whether the patient had taken in such things as were capable of exciting irritation, or whether he had collected them by degrees; suppose, for instance, the bile, such as I have describ'd it, and acid humours. Or even suppose, from whatever cause it might be, that the stomach was now seiz'd with an inflammation, as those reddish striae, and even the still more inflam'd state of the upper orifice, which was evident from the livor and blackness of this part, sufficiently demonstrated. And from hence you will readily understand why vomitings, a languid pulse, and a pain in the region of the diaphragm, immediately preceded death, especially as the diaphragm, at that time, labour'd more and more under the weight of the heart that lay upon it, which was increas'd by a very thick blood of that kind; and this blood stagnated the more, as the force of the heart, in expulsion, was more debilitated, as was evident from the debility of the pulse; to which if you also add the compression of the cerebrum from blood, by reason of the languid circulation, stagnating in the vessels of the meninges, and consequently the very small afflux of spirits to the heart at the time when there was the greatest need of them, it will be very easy to determine upon the causes that conspir'd to so sudden a death; which is not however to be wonder'd at, if, as Lancisi observes (*b*), we attend to more examples of the same kind, in those persons, where the heart, being affected with dilatation, the more easily ceas'd to move, inasmuch as it was overburthen'd, and presently, upon any slight accident in the constitution, oppress'd by the load of the stagnating blood: examples of which kind, that you need not go about to seek them in other authors, or turn back to the former letter (*c*), you will find in some of the next observations (*d*).

4. But from what cause shall we say the heart was dilated in this man? One part of the aorta was in him, as I have said, immoderately narrow; and how far this circumstance can avail to bring on a dilatation of the heart, will appear presently, and the observation of that most skilful anatomist Meckel (*e*), taken from a virgin, will confirm. Besides this deviation from the usual course of nature, which doubtless was a fault in the original formation, the man afterwards apply'd himself to such a kind of life as had a natural tendency to render the progress of the blood more difficult through that artery; for shoemakers not only, like other sedentary artificers, bend those lower large branches of the artery to angles, in more than one place, and keep them bent; but moreover, the more they bend themselves forwards, the more do they compress the viscera of the belly, which in most of them are generally full of meat and drink, and by this means also compress the diaphragm, so that the motion of the blood is less quicken'd through the belly and thorax; the branches of the aorta, and the trunk itself, being constricted and reduc'd to a greater degree of narrowness; and an obstruction being, by this means, put to the progress of the blood through the aorta, and, in like manner, to its egress from the heart, the heart must consequently impel the blood with greater efforts through this artery, and the artery also must resist and contract itself with greater force, till, for these very reasons, the structure of it was so

(*b*) De Subit. Mort. Schol. 11. ad Obf. (*c*) n. 10.

(*d*) n. 8. & 14.

Phyf. Anat. 2.

(*e*) Memoir. de l'Acad. R. de Berlin A. 1750.

vitiated, that it contracted the hardness which I have describ'd, especially near the heart; and in the valves, moreover, contracted that lankness and constricted state. And then neither could this artery yield properly to receive the blood, nor yet contract itself properly in order to propel it. Some portion of blood, therefore, must necessarily remain in the heart, and that so much the greater, as the valves, by reason of their rigidity, could neither sufficiently recline themselves to the parietes of the artery, in order to permit a free egress, nor yet, by reason of the same rigidity, and the lank and constricted state, being added thereto, could they sufficiently open and expand themselves, in order to prevent a return of the blood. Wherefore you plainly see in my observation, as also in the observations of others, for instance, that of Verdriesius (*f*), and Zwingerus (*g*), the first of whom saw the aorta internally bony, near the heart, and the last found the valves of the aorta hard and "cartilaginous", what causes, by resisting the heart, and by retaining the blood therein, (which, as it was in the greater quantity, would more irritate the fibres, and at the same time give more resistance to the encreas'd efforts of the heart) could by degrees more and more dilact, and dilate the heart; and that so much the more easily here, as both kinds of disease were join'd together in the aorta, and the blood not only gave more resistance from its thickness, but by the eroding salts with which, as this scabies demonstrated, it was pregnant, might have broken asunder those small bands, whatever they may be, that connected the fibres of the heart. But if this viscus, or any part of it, was, perhaps, somewhat lax, or infirm, from its original formation, so much the more easily could the whole, or a part of it, be dilated.

5. And it seems necessary to acknowledge this last cause, in some cases at least, if not in this, as when the obstruction is at the aorta, but the right, and not the left ventricle of the heart is dilated; which happen'd in that choirister, whose dissection is giv'n by Lancisi (*b*). For in general, and at other times, when an obstruction is made to the emissary of either ventricle, that ventricle is wont to be more dilated; suppose, for instance, the left, when the impediment is in the aorta. For which reason, I doubt, if Lancisi had put the finishing hand to his own writings, whether he would have subjoin'd the following things: when there is an obstacle in the aorta, that the dilatation "is wont, for the most part, to happen in the right cavities of the heart; but when it happens on the left side, it is almost always observ'd "in the auricle, and not in the ventricle; and that this was evident in the "case related in the second book of the Sepulchretum, section the seventh, "observation the forty-ninth, from the observation of Daniel Horstius," by Bonetus himself. For if he had read over that case, he would certainly have seen, "that the left auricle had appear'd bigger than the right," but nothing in particular of the size of the ventricles; only this his general observ'd, "that the heart was so much encreas'd in its proportion, that all who were "present greatly wonder'd at its magnitude." And if he had look'd back, not only upon the observations of others, but upon his own, he would have

(*f*) Eph. N. C. Cent. 6. Obs. 51.

(*g*) Eorund. Act. Tom. 1. Obs. 18.

(*b*) De Aneur. Obs. 53.

immediately

immediately observ'd, that he ought to judge otherwise; unless, perhaps, we suppose, that another very celebrated man would not have publish'd this himself, "That the right side of the heart is but rarely subject to aneurisms, and the left more frequently, appears from the experiments of Lancisi."

I, however, whether I consider my own observations, or those of others, seem to remember to have found, and to have read of, more aneurisms of the left ventricle, than of the right; but not many of the left auricle: and, in like manner, that the aneurisms of the left ventricle were join'd with a disorder of the neighbouring aorta, or its valves; but those of the right ventricle, generally, with some impediment, either in the valves, which are plac'd at the orifice of its emissary, or in the very passages of the blood through the lungs, or, finally, at the emissary of the left ventricle; some aneurisms excepted, in the observation of which, either those things that I mention'd just now do not seem to have been enquir'd into, or an hereditary laxity of the fibres, on the right side, according to Lancisi himself, ought, certainly, to be granted (*i*). Is not then, you will say, the muscular paries proper to the right ventricle thinner, and consequently weaker, than the other, and for these reasons more liable to dilatations? I grant it is, if equal causes, and applied in the same manner, contend with equal force to bring on a dilatation of the ventricles. But it is not my business to dispute in this place concerning this proposition. Wherefore, when there is an obstacle at the emissary of the left ventricle, nor yet this ventricle, but the right, or, if both of them, the right is the most dilated of the two, it seems that more strength than usual must have happen'd to the left ventricle, and less to the right, whether this was from the original constitution of the body, or from any other cause afterwards, as in that man, the short history of whose disease, and dissection, was formerly communicated to me, by a man, even at that time, particularly conspicuous for his humanity, not less than for his learning, and his virtue, and lately very deservedly taken into the number of the pontifical archiaters, Marc Anthony Laurentio. This was his account of it:

6. A certain man, being often troubl'd with a disorder similar to the nightmare, and in like manner with a difficult respiration, to which a slight fever had been join'd, seem'd to recover, almost entirely, by the loss of some blood. His disorder, however, coming on a-fresh, and his face and neck being livid, he died. The thorax being open'd, and water being found therein, so great a dilatation of the heart was observ'd, as had never been seen before, especially on account of the enlarg'd state of the right ventricle, and its annex'd auricle. And the aorta was contracted to an amazing narrowness, near to the heart.

7. It also sometimes happens, that a dilatation of the left ventricle, and, at the same time, of the right auricle, is found, as in that observation which was made by the most excellent Santorini, at Venice, in the middle of autumn, in the year 1708, and related to me soon after by himself, in the following manner. And I would have you compare this history with one of Valsalva's (*k*).

(*i*) Ibid. propos. 47.

(*k*) Epiſt. 17. n. 10.

8. A man, who had labour'd, before, under a difficulty of breathing, at intervals, at length crying out that he was dying, began to walk vehemently across the chamber, and soon after falling down on the bed, died immediately. The thorax contain'd many pounds of bloody serum, but not in equal quantity on both sides: the great artery was found internally rough, with bony scales, and among these were some tubercles. The left ventricle of the heart, and the right auricle, were dilated. To open the head after these appearances seem'd superfluous.

9. I do not doubt but you will be able, yourself, to explain the greater part of the remarks that are contain'd in the two last observations, even by the help of those things that I have said above. As to one thing, rather, which is contain'd in neither of them, you will perhaps ask of me, whether it was wanting; and if it was wanting, and particularly in the first, what are we then to think of the dogma of Lancisi (*l*), in which he has asserted, that from the dilatation of the right auricle, and ventricle of the heart, it follows, that the orifice which lies between both, and is furnish'd with triangular valves, must also be dilated in such a manner, that, as the blood can no longer be entirely precluded by these valves, a portion thereof, during the constriction of the ventricle, is of course driv'n back into the vena cava, through the apertures that are necessarily form'd between their edges, from whence a dilatation of the jugular veins is brought on, which, as they are external, and expos'd to the eyes of every body, in the neck, must be conspicuous, and the ventricle presently dilating itself, an equal and alternate constriction takes place: and these appearances sometimes impose upon unwary physicians for a pulsation, and contraction, of the carotid arteries. You will ask, therefore, whether this pulsation, or fluctuation, of the jugular veins, was in those patients whom I spoke of just now? Or, if it was not, how can it "with justice be call'd the pathognomonic sign" of a dilatation in the right cavities of the heart?

I, however, cannot certainly say, whether that pulsation was wanting in these patients or not; as I only receiv'd, briefly and in general, the principal heads of those observations which relate to their histories, by way of common discourse, from very eminent and credible men. Yet I am not ignorant, as Lancisi was not ignorant neither, that in a noble matron who was liable to asthmatic paroxysms, in whom there was a frequent pulsation of the jugular veins, and of the brachial also, Homberg (*m*) judg'd, that a very violent palpitation of the heart, without which these circumstances never happen'd, had, if I understand him rightly, not drawn asunder those valves, but had only forc'd them outwards alternately, with such an impetus, as to transfer each concussion to the venous blood; which concussions were so much the greater, as the blood, having dilated the ventricles to a great degree, could not, without difficulty, be sent into the arteries, which were now obstructed with polypi: although, as that heart is said to have been flaccid, like a bag that was made of soft leather, it is natural to suspect, that the orifice leading to the veins was enlarg'd, so that it could not be closely shut up by the valves. But you may make use of which-ever explication

(*l*) De Aneur. propof. 57, & 60.

(*m*) Mem. de l' Acad. R. des Sc. A. 1704.

you please, if, perhaps, by reason of some of the valves of the veins themselves, the reflux of the blood, through them, seem to you less easy: for either the veins are dilated, and so cannot be shut up by the valves; or they are not, and so the confluxions, especially the large ones, are also communicated through the valves.

But at the same time, other things also do not escape me, which Lancisi could not possibly know, as they were publish'd after his death. For the celebrated Morand (*n*), having observ'd in another woman, besides palpitation and faintings, a continual pulsation of the jugular veins, the thickness of which was equal to that of a man's thumb; and in the carcase of the same woman, as he had foretold, having found the right auricle of the heart almost fill'd with a polypous concretion, the branches of which reach'd through the neighbouring veins quite to the jugular, concluded that a portion of the blood which was obstructed by the polypous concretion, and prevented from descending into the ventricle, that this portion, I say, as often as the auricle contracted itself was repell'd, by the constriction thereof, into those veins, according to the direction of the ramifications of the polypi, and therefore had alternately dilated them. But after this, the very experienc'd man, Andreas Pesta (*o*), in that epistle where, supported by reasonings, and by observations, he so call'd into question the polypi in the heart, and other receptacles of the blood, in the living subject, that it seems by no means easy to give a clear, firm, and full answer to his objections, particularly describ'd what he found in three patients, who, "for some months before their death, had labour'd under this pulsation of the veins in the neck, a palpitation of the heart coming on at intervals, and difficulty of breathing also, "with swoonings, not without a pulse continually unequal, and intermitting." He therefore says, that he had found no polypus any-where, no expansion of the right auricle; but the ventricle join'd to it, twice as big as it naturally is in one, and in the other even much larger; but in a third he had not found even this, which I suppose was prevented, partly, by a kind of large bony ring of the pericardium, that adher'd very closely to the heart, by the constriction of which ring, doubtless, the left ventricle was made three times less than when in its natural state, and scarcely any traces of the right auricle appear'd; whereas the left, which was not compress'd by the bone, was dilated to a surprizing extent. And taking all these things together, we must consider, how far it is proper to make use of the sign which the celebrated physician Lancisi propos'd.

10. As I was therefore observing, that out of the five observations just now pointed out, there were at least three, in which, if not a dilatation of the right auricle also, yet at least a dilatation of the right ventricle, was found; and as I was joining these together with the observations of Lancisi, it seem'd to me, that he had indeed propos'd a true sign, as it really happens in many, but that it was to be explain'd, sometimes, in the way that he himself plann'd out, and sometimes in the other manner, that Homberg has taught; although it is easy, as I granted above (*p*), that the orifice of the ventricle should be

(*n*) Mem. de la même. A. 1732.

(*o*) Epist. de Cord. Polyp. 9, & 13.

(*p*) N. 9.

dilated in the same manner as the ventricle itself, or if the parietes of the ventricle are too much expanded, that those parts to which the little chordæ tendinæ of the valves are tied, may be now too distant from that orifice to be able to perform their usual office to the valves, so that they may have it in their power to shut up the orifice speedily, and entirely: unless, perhaps, the valves (which will generally be observ'd in this kind of hearts) are always enlarg'd also, and the little chords produc'd.

But in the observation of Morand, and in that of Faſta, which is produc'd in the third place, I confess, no dilatation of the cavities on the right side of the heart occurs. Yet in each of them it is to be acknowledg'd, that there was an impediment to the blood, as it was about to enter the right ventricle: for in the first, it is indicated by a very great dilatation of the jugular veins, join'd with a palpitation of the heart, and swoonings; and in the last, by the decrease of the left ventricle, and the surprising expansion of the auricle on the same side; forasmuch as these retarded the passage of the blood from the left, so much more, it seems, ought to be accumulated in the right ventricle, and resist that which is brought thereto, which as it has no auricle to be diverted into alternately, it seems that it must have distended the nearest veins by its so much greater quantity, and have remov'd their parietes, and the valves that are affix'd to them, very far from their axis; and that by this means the concussions, which the valvulæ tricuspidæ, when driven upwards by the heart, that palpitated vehemently, communicated to the blood, might have been more easily carried on, and continu'd: as in the observation of Morand, when the veins were evidently dispos'd in the same manner, they were communicated by that portion of blood which, not being able to enter into the right ventricle, (whatever was the real cause of that impediment) was repell'd upwards by the auricle when it contracted.

Besides these, other cases may happen, in which neither the right ventricle, nor its auricle, being dilated, the blood, nevertheless, returns into the veins by the intermediate or auricular orifice, when the ventricle is in contraction, and for that reason alternately raises them up. For instance, if any triangular valve is become contracted, or inflexible, and from thence unfit to perform its office; or if any of those little chords, which I spoke of just now, being eroded, ruptur'd, or relax'd, are no longer able to retain the valve in its place, so as to shut up the orifice, but suffer it to be inverted outwards, and by this means leave a passage open for the return of the blood.

To any one, therefore, who shall duly weigh all these circumstances, I think it will seem, that the sign propos'd by Lancisi very often, indeed, indicates a dilatation of the right ventricle; but sometimes does not indicate this, yet always some disorder or other, the seat of which is either in the right cavities of the heart, or the effects of which relate so far to these cavities, that the circulation of the blood is not naturally perform'd in the right side of the heart.

11. But that we may make the best use of this sign, we must first of all take care, lest, perhaps, sometimes, instead of a palpitation, there is a kind of alternate turgescency of the jugular veins, answering to a violent inspiration, or expiration; as in that experiment which I shall describe to you

hereafter, in another letter (*q*); but it will be easy to distinguish, whether the dilatation agrees more with the number of inspirations, or the number of pulses. After that, if we are convinc'd, that there is in reality a pulsation, we must not suffer ourselves to be so deceiv'd, as to believe that to be a pulsation of the jugular veins, which is, in fact, the pulsation of the carotid arteries. And to this I find a passage of Galen refers (*r*). In violent pains of the head, "the veins of the temples," says he, "and especially" "where these pains are attended with much heat, seem to beat, and to vibrate, as it were. But I have more frequently seen the jugulars of the neck, that is to say, those which are plac'd superficially, agitated with a certain motion not unlike a pulse. The motion in the temples seems also to happen from the subjacent arteries, at the time that they pulsate most." I said, that the passage of Galen referr'd to this, if we conjecture from the last words of his, in what manner he himself would have explain'd that which he had written in the foregoing. But if we would rather chuse to suppose, as perhaps we ought, that he intended quite different things in the former and the latter words, we shall confess, that the pulsation both of the temporal and jugular veins, was also formerly observ'd. For that "vehement pulsation of the jugular veins," mention'd by Hippocrates, is understood by Jacotius (*s*), and Duretus (*t*), of the arteries: which we are not at liberty to do in this of Galen, where the arteries are expressly distinguish'd from the veins, and the external jugular veins are most clearly intended. But when the large pulsation of the subjected arteries alternately raises up these veins, it will not be difficult to observe, that not only the veins themselves, but the surrounding parts of the neck, are at the same time rais'd up, and those parts even more, which are more immediately opposite to the carotids.

But if these pulsating vessels in the neck, being dilated, are prominent and turgid, then, indeed, we may distinguish the veins I am speaking of from the carotid arteries, if we attend to their external situation, and the softness of their parietes; and especially if with Morand (*u*) we observe, that upon pressing the finger on them, that part of the vessel which is below the finger shall, according to the laws of the circulation, subside; and that part which is above is increas'd, or at least preserves its former distension. And I would not have you be surpriz'd, that, in distinguishing the pulsations of the veins from the pulsations of the arteries, I have not taken notice that it ought to be attended to, whether the pulsations happen at the same time with the pulsation of the heart; for you will see hereafter, that hence we may be sometimes deceiv'd (*x*). We must, besides, observe, whether there can be any other cause of the sign propos'd, which does not consist in an organical disorder of the heart; for instance, in virgins affected with the chlorosis. For although Lancisi (*y*) does not doubt, but a pulsation of the jugular veins happens in the same manner, in these patients, and in particular

(*q*) Epist. 19. n. 33, 34.

(*r*) In I. Proreth. Hipp. Comm. 3. n. 9.

(*s*) L. 2. Comm. In Coac. S. 2. u. 42.

(*t*) In Coac. l. 2. c. 10. n. 1.

(*u*) Loc. cit. *supra*, ad n. 9.

(*x*) N. 12.

(*y*) Propof. 57. *ibid* cit.

when they go up steep places, and by that motion accelerate the reflux of the thicker blood, towards the right side of the heart, out of which it cannot be transmitted with equal dispatch, through the vessels of the lungs that are obstructed, compress'd, or convuls'd; and although he also adds, that if this pulsation does not yield to remedies, but continues long, even in these virgins, as he himself has sometimes observ'd, a dilatation of that part of the heart is at length brought on; yet this is no reason why we should suppose it before; since nothing more frequently happens, than that, together with the chlorosis, all the inconveniences which attend thereon vanish.

But when neither this disease, nor any other of the same kind, is join'd with that pulsation; he then says, that a dilatation of the right cavities of the heart is so much the more signify'd (*z*), if other marks are observ'd which jointly prove it, among which he places anguish of the heart, and palpitation, a pulse for the most part large and equal, this, and oppressions of the heart, being confirm'd by Albertini (*a*), to which he also adds swoonings. And you will find, that the other marks often answer, even from reading over again, either those histories which are just now taken notice of (*b*), or those which are hitherto describ'd in the present letter, or at length from those that are given in the beginning of the last letter (*c*). But perhaps you will be in doubt as to the pulses, since you will remember, that out of three persons, who were dissected by the celebrated Paſta (*d*), there was not so much as one, who had not continually an unequal, and intermitting pulse, although two of them, without doubt, had the right ventricle of the heart dilated. I would therefore have you observe, that the sign taken from the pulse, is not necessarily a true one, when other disorders are added to the dilatation of the right cavities of the heart, which you will find, from reading Paſta himself, did really exist in those two, just as in the choirister whom I mention'd above, from the observation of Lancisi (*e*), in whom an inequality, and intermission of pulse, were not wanting. But on the other hand see, whether in those where Valsalva (*f*), at the same time, remark'd the dilatation of those cavities, and attended to the pulse, the pulse, unless perhaps in the latter part of the disease, was unequal. Neither had the shoemaker, whose history I have describ'd to you (*g*), any inequality in his pulse, when free from his faintings, not even when death was near at hand. And that you may perceive the same thing to have happen'd to others also, which happen'd to Lancisi, Albertini, Valsalva, and myself; look, in particular, upon that vast dilatation of the right auricle, the figure and description of which are publish'd by Peter Dionis, in the latter part of his anatomy (*h*). The auricle, indeed, you will see was bigger than the head of a new-born infant; yet will find not the least mention of any inequality in the pulse. But there is another, who after a difficulty of respiration, and intermission of the pulse, being observ'd in a patient, writes, "that the magnitude of the right ventricle of the heart, and its right auricle, were so en-

(*z*) Propos. ead. & 60.

(*a*) Comm. de Bonon. Acad. Tom. I. in Opusc.

(*b*) n. 9.

(*c*) n. 6. 8. 10.

(*d*) *supra*, ad n. 9.

(*e*) n. 5. (*f*) n. cit. 6. 8. 10.

(*g*) *supra*, n. 2.

(*h*) L'Anatom. de l'homme.

“creas’d, that one very large cavity appear’d.” I grant it; but it is not added, what disorder there was in the left cavities, nor in the aorta, nor in the lungs, nor what disorder there was not; nor yet, whether this intermission was of long continuance, or only on the last days of the patient’s life: although it is sufficient for my purpose here, that there often is an equality of the pulse, when there are dilatations in the right side of the heart.

12. I observe, however, that this observation, and that publish’d by Dionis, agree very well in two circumstances. For first, if in this one very large cavity was found to be form’d, from the right auricle and ventricle; in the other, the orifice that is interpos’d betwixt the two cavities, was enlarg’d in a surprising manner. Again, if in this, “the parietes of the auricle were thick, hard, callous, and internally cartilaginous;” in the other, the internal membrane of the auricle was cover’d over with a bony, scaly substance, like to a very hard egg-shell. And this being the state of both cases, doubtless there was a pulsation of the jugular veins in both patients, by reason of that very enlarg’d condition of the orifice, which has been so often mention’d; but in neither of them, certainly, was it owing to the alternate contractions of the right auricle, as this being prevented by the internal crust, whether cartilaginous, or bony, and even by the very hardness of this, or the other parietes, could not contract itself; but remain’d rigid, and inflexible, in perpetual dilatation. Wherefore, as in these, and in many other cases, and in that, particularly, in which (i) scarce any vestige of the right auricle remain’d, this pulsation is to be accounted for from the ventricle, which in some others may be from the auricle: and if you should, perhaps, enquire, by what method it is possible to distinguish from which of these cavities it happens, I should say it was possible to distinguish, when both the arteries, and jugular veins, vibrate with somewhat less frequent strokes. For if by fixing your eyes upon the veins, and at the same time applying your fingers to the artery of the temples, or the wrist, you evidently perceive, that the veins are lifted up at the very same point of time, in which you feel the pulsation of the artery; you will then understand, that they are elevated from the contraction of the right ventricle: but if on the contrary, then you will understand that the pulsation of the veins is not owing to the contraction of this ventricle, but of the annex’d auricle. For you know that the arteries do not pulsate, when the auricles, but when the ventricles, are contracted; and on the other hand, that they do not subside when the ventricles, but when the auricles, are contracted. Wherefore, if the jugular veins are elevated, when the arteries are subsiding; the pulsation of these veins cannot be owing to the right ventricle, which is at this time inactive: but on the contrary, if the arteries, and these veins, pulsate at the same time; the pulsation of the veins must then of necessity be from the ventricle, which is at that time in action, and not from the auricle, which is inactive; the force of contraction in the ventricle, at that time, forcing the valves vehemently upwards, if they shut up the orifice; and giving a concussion to the blood in the veins, or driving back a portion of its own blood into the veins, if the orifice between the two cavities, is not closely shut up by the valves, according to the intention of nature; the probable mark of which is to be

(i) *supra*, n. 9.

taken from those symptoms that are pointed out above (*k*), of the cavities being dilated in the right side of the heart.

And thus far I had to say at present of the pulsation in the jugular veins. From which sign, and from my examination into it here, if you see that any advantage can be drawn, in order to distinguish the most hidden disorders of the heart; you see at the same time, whether it is with justice, or with injustice, written against the more modern physicians, as follows: "Of what advantage is the exact knowledge of the use of the valves of the heart, to a physician who has the care of such disorders, in order to ascertain the disorder?"

13. But lest you should, perhaps, believe, that I am, in the mean while, forgetful of my promis'd observations (*l*), those, for instance, from which you might understand it frequently to have happen'd, that where the heart was dilated, these patients were carried off by a sudden death, more quick than thought; although I have many of my own observations, which I refer to other letters, and many of my friends, I choose rather to add another observation, to that which I produc'd from the narration of the celebrated Santorini, by which I pay a tribute to the memory of my auditor Angelo Nicolao Villi, who was very remarkable both for his probity and diligence, and whose progress in the very beginning of his medical practice was intercepted by death. Thus it was that he wrote to me, about the end of the year 1727.

14. A huntsman, who was almost continually short-breath'd (for this word he chose to make use of) having complain'd eight days together, that he was not very well, but only complain'd of his stomach in particular; at length, when he was performing some religious ceremonies, having taken a little food about noon, he was forc'd to recline himself on the bed, and before he could well call his wife to him, he died. The skin of the carcase, which was of the colour of cachectic bodies in general, and the very thin adipose membrane being incis'd, the belly and thorax were presently open'd. In the belly every thing was found. But in the thorax, the lungs were very turgid with air, and every where connected with the neighbouring parts, the upper only excepted, and indeed almost grown into one substance with them; so that great force was requir'd, in order to separate them from the ribs, the diaphragm, and the mediastinum. Within the pericardium was scarcely any moisture, and the heart was flaccid, but extremely large.

15. It seem'd to Villi, that the cause of all this man's symptoms, and even of his death, was to be referr'd to that very great cohesion of the lungs, with the neighbouring parts. But I took notice to him of the observation of Diemerbroeck (*m*), who found the lungs not only connected to all those parts, but also to the uppermost parts, and this so firmly, that they could not be pull'd asunder without a great laceration; yet the man in whose body he found these appearances, had liv'd very healthy, and free from any difficulty of breathing, till he died by being hang'd. But altho' I should even attribute something to this adhesion, according to what I conjectur'd in a former letter (*n*) on this subject,

(*k*) *supra*, n. 11.

(*l*) *supra*, n. 3.

(*m*) *Anat. l. 2. c. 13.*

(*n*) *Epiſt. 16. n. 15. & 16.*

after having pointed out that same observation of Diemerbroeck, and others; yet I should not doubt, at the same time, but much more was to be imputed to the very great and increas'd magnitude of the heart, especially as it was flaccid, and that for the chief of those reasons which are spoken of above (*v*), on occasion of the death of the shoemaker. Moreover, the effects of the heart being distended, and for that reason urging and pressing the mediastinum to the lungs, and the lungs to the ribs, may in part also, sometimes, be this very adhesion of the lungs, which was observ'd in the case of the shoemaker, as the effect thereof, on account of the pressure and force applied to the lungs, is certainly a difficulty of respiration. For which reason, I wonder the more, that the increas'd bulk of the heart is not attended to in the histories of asthmatic persons, since it is frequently found to be enlarg'd to a considerable degree; as you may read in that which is giv'n in the first section of the second book of the Sepulchretum (*p*), and is without doubt frequently the cause of many of their symptoms. For although sanies, indeed, was not wanting in the bronchia of the lungs, where they adher'd to the pleura and pericardium; nor yet other appearances very remote from the natural constitution, among which was the substance of the left lobe of the lungs "being compact and dense, and representing the parenchymatous substance of the liver, and of the same palish red colour," that is, being seiz'd with a mortal inflammation, though it is not there acknowledged; yet the heart ought by no means to have been omitted among the causes of that asthma, by the very enlarg'd state of which, the circulation of the blood, and consequently its passage through the lungs, must, without doubt, of course have been greatly retarded. For "the heart was immensely large, and answer'd to the increas'd size of the pericardium;" and the pericardium was so large, that it might be said "to have lin'd the whole cavity of the thorax."

How different was the opinion of that great physician Ballonius, as you will read in the same section (*q*). "A certain man," says he, "breath'd short, and with difficulty, and became lean and thin. The lungs were universally accus'd as the seat of the disorder. The body being open'd after death, nothing was found worthy of notice in the lungs. But, what was very surprising, the heart was equal, in magnitude, to the size of a pretty large head; and doubtless, in consequence of its great increase, all the *σπέρρον* & *συνδρομή*, the conflux and concourse, of the blood and spirits, was made to that part." And thus he express'd himself, according to the custom of his times. And Marcus Gerbezius (*r*), in a monk, "who had his heart so much increas'd in its bulk, that being weigh'd in the scales, it was found equal to thirty ounces," but had the lungs very small, extenuated, flaccid, and corrupt, openly declar'd, in regard to the case of this patient, that he conjectur'd the enlarg'd state of the heart to have been "the sole cause" of the long difficulty of breathing, and its increase within the last year, and finally of the corruption of the lungs, "inasmuch as, by its bulk, it was a cause of compression to the lungs, and consequently re-

(*v*) N. 3.(*p*) In Additam. Vid. Schol. ad Obf. 34.(*q*) Obf. 91.(*r*) Eph. N. C. Dec. 3. A. 9. Obf. 223.

“tarded the progress of the blood through them.” This cause you will, therefore, add to the others, on account of which, the heart, when enlarg’d, is injurious to the motion of the blood through the lungs, and for that reason renders breathing difficult: which symptom, you will read, here and there, was join’d with that disease, not only in our histories, but also in the histories of others, as in that of Hottinger (*s*), of a man whose heart was larger than the heart of an ox, the auricles being in proportion to that bigness; and in that of Zwinger (*t*) of another man, who had the bulk of his heart very much increas’d, together with a remarkable magnitude of the right auricle, on the same side; and also that of Fraundorffer (*u*), from an infant of nine months of age, in whom the same auricle was so much enlarg’d, that it not only cover’d over the whole right side of the heart, but was even extended beyond the apex. And to these we may add, to take no notice of others, the observations also of Riedlinus (*x*), who saw the heart far greater than usual; and of Budeus (*y*), and Laubius (*z*), the first of whom found the heart enlarg’d to an extraordinary size, and the last found it three times larger than usual; and that of Graffius the son (*a*), who met with the right auricle of the heart, when exceeding its usual bulk, even in a double proportion.

But if in all these cases, you perhaps ask me, what symptoms were observ’d in the living body relative to the disorder in question, besides the difficulty of breathing; you will find, that in the last, together with a palpitation of the heart, which is also mention’d by Hottinger, there were frequent swoonings, and finally unexpected death. But in the remaining cases, there is hardly any thing taken notice of, which can be refer’d to this cause, if you except the history of Zwinger, in which the pulse was small, languid, and unequal; and that of Riedlinus, in which the pulse was remark’d to be unequally intermitting: yet there were, in both of the patients, disorders of the lungs also, and water extravasated in the thorax; as also in that man whose history is given by Hottinger. But I do not wonder, that other symptoms of this kind are not mention’d by other authors; the age of the patient, or the shortness of the time in which he could be examin’d, or the negligence of those who reported them, or the number and variety of things which were to be written, sometimes forbidding, or, finally, other causes of different kinds being obstacles thereto. For you will scarcely believe, that in the most renown’d man Alexander Marchetti (*b*), though there was an enlarg’d bulk of the heart, and a very remarkable dilatation of this right auricle, there was no disorder of respiration, and much less other symptoms, peculiarly referable thereto. Yet I would have you believe nearly the same of a woman (*c*), in whose history, in like manner, you will find nothing of that kind, notwithstanding the same auricle “was so far dilated, that it was “not only equal in size with the ventricle to which it was connected, but “even exceeded it in magnitude.” But in the merchant (*d*), whose heart,

(*s*) Ibid. Obf. 89.

(*t*) Dec. ead. A. 5. Obf. 8.

(*u*) Ibid. Obf. 124.

(*x*) Earund. Cent. 3. Obf. 45.

(*y*) Cent. 2. Obf. 106.

(*z*) Cent. 10. Obf. 84.

(*a*) Cent. 5. Obf. 24.

(*b*) Cent. 7. Append. n. 4.

(*c*) Cent. 4. Obf. 120.

(*d*) Ibid. Obf. 115.

being

being large and tumid, had the right auricle, in like manner, much expanded, the same celebrated author of the observation, Thebesius, had, at least, observ'd for many years past, a difficulty of breathing, and "other symptoms at times," which were perhaps owing to the same cause.

And that we may mention something of the left auricle also, of the dilatation in which there are fewer examples extant, than in the right; besides what I have pointed out from the celebrated *Pasta* above (e), and what you will find in this letter, and in others of mine, *Schreyus* (f), an ingenious man, observ'd, in a boy of seven years old, a palpitation of the heart, with a quick and feeble pulse; whereas the heart of this very boy, "being of a stupendous magnitude, exceeded that of an adult in its form, the left auricle being equal to the size of an egg:" but there was a great quantity of water both in the thorax of this boy, and in that of the merchant. And if you chuse to consider other examples of a dilated heart, you have many mention'd up and down in these letters: and besides those which the celebrated *Van Swieten* will point out (g), you find a great many of other authors, and of his own, in the writings of that great man *Senac* (h), in the chapter where he particularly treats of that subject, with such copiousness and skill, that when you have read this chapter through, you will not be much at a loss, either in regard to the causes which dilate the heart, or in regard to the mischiefs that proceed from the heart when dilated, or in regard to the remedies which may be useful to diminish them, or, finally, in regard to the signs that indicate not only a dilatation of the heart, but also of the particular parts of it, especially if you attend, at the same time, to those things which he has either before remark'd, or excepted, in regard to the same disorders (i), as far as they are referable thereto.

16. Thus far of aneurisms of the heart. Now the next thing is to give you instances of aneurisms in the aorta. And I will begin with one whose history, I think, by no means deserves to be forgotten, whether on account of the man who was taken off by the disease, or, particularly, on account of those who have written of his disease. The patient was *Anthony Ferrarini*, one of the first physicians at *Modena*; and the physicians who wrote of his disease were *Bernardino Ramazzini*, and *Marcello Malpighi*. For as I read over all the medical consultations of *Malpighi*, written with his own hand, (neither the number of which, nor the method of some in particular, are easily to be judg'd of, from those consultations of the same man, which are publish'd by some persons) and all the medical letters that had been sent to him from all quarters, by the means of *Albertini*, I by chance lit on these, which *Ramazzini* sent to *Malpighi*, from the beginning to the very end of the disease I have spoken, for the sake of consulting him. From all which letters, and other loose papers, I carefully collected and digested the history, which I shall give you in the following manner:

17. *Anthony Ferrarini*, being of a melancholic temperament, as it is call'd, and of a habit inclining to the cachectic kind, was wont, continually,

(e) *N. 9.*

(f) *Aët. N. C. Tom. 2. Obs. 34.*

(g) *Comment. in Boerh. Aphor. § 176.*

(h) *Traité du Cœur, l. 4. ch. 8.*

(i) *L. 4. ch. 4. n. 4. ch. 9. n. 7. & ch. 11. n. 9.*

to be spitting up much saliva, and this pregnant with many corrosive salts; and having been now, for a year, troubl'd with a very violent, and almost continual cough, to which was at length added some difficulty of breathing, especially when he went up steep places; about the end of August, in the year 1689, he was seiz'd suddenly, in the middle of the night, with such an oppressive torture at his breast, that he was afraid of immediate suffocation. Yet by expectorating a considerable quantity of catarrhus matter, that oppressive torture was remov'd. But after an interval of two days, when he had a motion to stool, in consequence of a glyster, being seiz'd with the same oppression, although less violent, and being afterwards compell'd to draw his breath with his neck stretch'd out, he found considerable ease from the loss of blood; but this ease did not continue. For very often, watchings, and sometimes a most troublesome cough, and generally dry, but chiefly a sensation, as it were of a cord binding the aspera arteria, still afflicted him greatly; notwithstanding he could again lie down a little sometimes. In the mean while he became emaciated, and the paroxysms became more frequent, and more violent. Yet his pulse never discover'd any thing feverish. It seem'd proper to the other physicians who were there, that blood should be taken away from the foot, contrary to the opinion of Ramazzini: and by this evacuation, his strength, which had kept up pretty well till then, became much decreas'd, and his disease more violent. For he was now attack'd, every day, with that oppressive torture, attended with the sense of constriction in the aspera arteria, and fauces, sometimes three or four times, and that for two hours together, with so much violence, that there was nobody who did not think he was about to be instantly suffocated. He did escape however, not by discharging any thing from his mouth, but by falling into a universal and plentiful sweat. Yet whether he endeavour'd to swallow food, or any thing else, or whether a glyster was given him of milk, and not only of any other fluid; that oppression, and particularly that constriction, immediately return'd. When he was free from these symptoms, he perceiv'd no pain or uneasiness in any part, if you except the accusom'd difficulty of breathing which was moderate, and a sense, as he call'd it, of a kind of air ascending from the hypochondria, to the fauces, which circumstance, together with the sudden invasion and departure of the fit, and the relief that he frequently found from the eruption of flatus, and the melancholic temperament which I mention'd before, induc'd not only the sick physician himself, but most others, to think that the paroxysms were to be accounted for, almost as in hysterical women, only from irritated and convuls'd nerves.

For although in the beginning, some conjectur'd that a viscid matter was collected in the lungs; and others, that a thin defluxion was distill'd upon them, from the glands of the fauces; yet afterwards, most of them, as I have said, thought that the disorder was a convulsion, from the nerves being now and then irritated, by the hypochondriac juices, which some expressly deduc'd from the spleen: although others suppos'd the irritation to arise even from the brain itself, by reason they had observ'd something epileptic in the paroxysms. Yet some were not wanting, who, as they could by no means understand, how he could possibly survive so many, and so violent paroxysms, and not only survive, even in spite of so much abstinence, but not have his

strength entirely pull'd down, suspected that there was some witchcraft in the case. Malpighi alone, as almost all his letters to Ramazzini clearly shew, fear'd, lest beside irritations of the nerves, "some great obstacle should lie conceal'd in the constitution, some organical injury, which had been brought on by the humours that were loaded with corrosive salts;" it was, therefore, with great caution, that he approv'd of the use of narcotics, which had been sometimes giv'n to the patient, or of baths which had been propos'd, but rather approv'd of other things, that were less to be suspected, or, according to his modest manner, recommended. At length, within the seventieth day from the first attack, the patient was constrain'd to yield to the violence of his disease, having been under a necessity, for all that long space of time, to sit up in bed almost always, or on a chair, in order to draw his breath more easily, as he did particularly, if he sat with his head inclin'd, or rather with his body bent forwards in the manner of a bow; and for this reason he almost continually sat in that posture.

The abdomen being open'd, neither the spleen, nor any other of the viscera, had the least morbid appearance. In the thorax also, the lungs were found to be sound, and unhurt. But in the aorta, where it rose above the heart, a great aneurism was seen, from which they took out a pound, and more than that, of blood, in the middle of which was a polypous concretion, of the length and thickness of the fore-finger.

18. As there had been other symptoms in Ferrarini, which we afterwards observ'd in the marquis Paulucci (*k*), from the same cause; so there were also these in particular, which you will now add to what I have formerly said of Paulucci, that he felt a kind of air ascending from the hypochondria, and that he sat in no posture more conveniently than with his head and body inclin'd forwards. Of which circumstances, as the one might have led us into an error, so the other should have averted us from it. For if you would have understood the first as a sign of a hypochondriac convulsion, by which alone you would explain those horrible paroxysms; the second was flatly against this conclusion, inasmuch as it was rather a symptom of quite an opposite cause; I mean, that there was some obstacle in the thorax, which press'd more upon the aspera arteria, unless it was drawn to some distance from that tube by the inclination of the body forwards. Thus did Ramazzini explain the case, when he related the dissection I have just giv'n the detail of, to Malpighi, in like manner as you will see that Reiselius, in an observation, publish'd that very year, and afterwards transfer'd into the Sepulchretum (*l*), explain'd the case of a boy, who "perceiv'd, that he was reliëv'd from the very great stricture of his asthma, when he lean'd his head" and chest forwards upon a bench as he stood, without doubt, because the "heart being extremely enlarg'd, he was more at ease if it lay upon the sternum, than when it press'd upon the lungs in a supine state." So Vieussens (*m*) afterwards brought as a reason, why a soldier made his respiration less difficult, by sitting in the same posture in bed, that which I have describ'd in Ferrarini; I mean, that the heart being greatly dilated, with a kind of polypous concretion, so compress'd the aspera arteria, in a

(*k*) Epist. 17. n. 26. (*l*) in Addit. ad Sect. 1. l. 2. obs. 29. (*m*) Traite du Coeur ch. 1.

supine posture, as to bring on danger of suffocation. Nor, perhaps, was there any other cause, why he also, whom I have mention'd from Dionis⁽ⁿ⁾, as having the right auricle of the heart only dilated, kept himself almost in the same posture, except that the lungs suffer'd less from the bulk and weight thereof. But Freind saw, that the same posture was more convenient to another, who labour'd under an aneurism of the aorta in the thorax^(o); and Albertini^(p) recounts this very circumstance, among the signs which do by no means slightly indicate to us the dilatations of these receptacles of blood within the thorax. Nor did what Pacchioni observ'd^(q), in a certain patient of his, tend much less to prove the same thing; for "as often as a great danger of suffocation came on, so often was it an ease and alleviation to him, to incline his head, and to raise his hips high; and thus the diaphragm was at least reliev'd of some part of its burthen, that is the heart," which was twice as big as is natural: I say the diaphragm; for the same inclination was a relief to that, "whether the patient was in a prone or supine posture." But another patient, in whom the heart was also "enlarg'd in its bulk," that is describ'd by Beggius^(r), escap'd from the danger of suffocation, if "his chest was inclin'd towards his knees, or he sat a little prone." But I shall also take notice of other examples of this kind below.

19. Yet you will, perhaps, say, that it appears in the first section of the second book of the Sepulchretum^(s), and in like manner in the thirteenth of the former book^(t), from the observations of Willis, that there were patients, who, except they kept their head always erect, or inclin'd forwards, some immediately fell into tremors of the hearts, and *deliquia* of the spirits, and others, which is more to the present purpose, became immediately short of breath, and breath'd with great difficulty, like a person who was dying; whereas, notwithstanding all this, neither of them had aneurisms in the thorax, but both had a large collection of serum in the ventricles of the brain, that was salt and acrid; and this serum, when the head was not erect, or not inclin'd, falling back towards the origins of those nerves that go to the præcordia, had excited very great convulsions thereof.

But I do not speak here of the head being erect, so much as of the thorax, in particular, being inclin'd forwards: and this I moreover say, that the patients, in whose brain such a great quantity of serum of this kind was extravasated, could not be without other symptoms of disorder in the head, which those whom I have spoken of were in general free from, when, at the same time, they had many symptoms, which shew'd that the principal seat of the disorder was in the thorax, if you would be at the pains to compare the present symptoms with the past. For some fell into the disorder from very violent passions of the mind; as Paulucci, and he whom we have mention'd from Dionis; and others, as Ferrarini, from being agitated with a long and violent cough.

And that from a cough of this kind, the natural motion of respiration is very frequently and violently chang'd, and consequently also the motion of

(n) Suprà, n. 11. & 12.

(o) Hist. de la Medec. I.

(p) Opusc. cit. suprà, ad n. 11.

(q) Oper. Edit. 4. vers. fin. Hist. 2.

(r) Ibid. Hist. seq.

(s) Obs. 164. (t) Obs. 4.

the blood, and that sudden repercussions thereof are made upon the receptacles of the blood in the thorax, is evident; so it is no less evident, that in the passions of the mind, the course of the blood through these same passages is, sometimes, for a long while, variously and vehemently excited, and, sometimes, as variously and vehemently retarded, as the face, the respiration, and the pulse, do, at such times, certainly and jointly demonstrate: so that it is not to be wonder'd at, if, from a violent effort to suppress, or dissemble, indignation, that great aneurism should happen in the right auricle, as related by Dionis, no more than it is to be wonder'd at, that so great a dilatation of the heart, and aorta, had happen'd from the same cause, as related by Harvey (*n*); so that the friends of the patient, just as was said of Ferrarini, before the dissection of the body, believ'd, from the unheard-of violence of the disease, that the man "was under the malicious influence of a witch, or beset by some evil spirit." And such is the force of human passions, in dilating the channels and receptacles of blood in the thorax, that Albertini with justice deduc'd a reason from hence (*x*), why these dilatations are so seldom found in beasts, and so often in men.

When, therefore, these or other causes have preceded, from whence aneurisms may take their origin, I shall conjecture, says the same author, so accurately, that I can add nothing thereto, that such aneurisms are already form'd, not only when I perceive that most of the signs, by which these disorders are wont to shew themselves, are present, but also when I perceive, that there is no other hidden disorder in the thorax, by comparing the causes and signs of other diseases, and the effects of remedies one with another. For he would form a very ill conjecture about an aneurism, who should not attend to these things. So one of the two men, whom the celebrated Capperus (*y*) has describ'd, breath'd with great difficulty indeed, and "was under a necessity of sitting with his body so inflected, that he seem'd, as "it were, to conceal his head between his knees;" yet this man had no aneurism, and even "his heart was very small." But other signs of an aneurism were wanting, and he was evidently phthisical. So the boy spok'n of in the Sepulchretum (*z*), whose death was not brought on by an aneurism, but by a kind of fleshy mass, which adher'd closely to the pleura and the ribs, complain'd of an obtuse pain in the chest, and a difficulty of breathing; so that in an obscure disease, which had taken its beginning from a blow of one side, receiv'd from a very violent fall, any one might have been led to suspect an aneurism, especially as that symptom had at length been added, which I have told you was observ'd in Paulucci and Ferrarini; for the boy could not now go to sleep, "except with his head inclin'd on a table that had a great declivity." Yet other marks of an aneurism, and those such as might be depended upon better, were wanting in this boy, that were present in them. And I have put you in mind, that not some symptoms only, but the greatest part, ought to be attended to, for this reason, because as they do not all, at all times, occur, nor certainly did all occur in

(*v*) De Circ. Sangu. Exerc. Anat. 3.

(*x*) Opusc. cit. supra, ad n. 11.

(*y*) Aët. N. C. Tom. 4. Obs. 47.

(*z*) L. 2. S. 2. Obs. 4. in Addit.

those two patients mention'd above; so if you consider some only, you will often be deceiv'd.

20. You will, perhaps, ask, how it can happen, that although there was in both of these cases a dilatation of the aorta, yet there was in neither of them any pulsation? The absence of this symptom, doubtless, drew most of the physicians of both patients into an error: although, as there may be a pulsation without an aneurism of the artery (*a*), so there may be an aneurism of the aorta without a pulsation, whether because this is only to be slightly observ'd by the patients themselves, rather than by the physicians, and only before the disease begins to grow violent, as it was perhaps in Ferrarini; or because, in others, it occurs in the beginning of the disorder, when it first discovers itself to the physicians, as certainly happen'd in Paulucci, before he return'd into his native country, and after that becomes so obscure in both, that there seems to be none. But as I formerly mention'd three causes of this obscurity (*b*), I will not repeat them here. In regard to the first of them, only, as it relates most to these two cases, it is sufficient to add at present, that it often takes place even in external aneurisms, as I have also seen, and Parey formerly rightly admonish'd (*c*), when he had propos'd pulsation among the signs of aneurisms. His words are, "Do not let us be deceiv'd by the signs above-mention'd: for sometimes, in very considerable aneurisms, we cannot perceive even the least pulse, because the blood is collected into thrombi, and coagulated." And if some surgeons, afterwards, had not been forgetful of this very just admonition, or had believ'd, that this could not happen in small aneurisms; doubtless, neither that friend of Ruyfch (*d*) would have dar'd to open a small tumour about the ankle, of the bigness of a walnut, notwithstanding "all pulsation was wanting, by reason of the coagulated blood;" nor Ruyfch (*e*) would have again admonish'd us, "That not in every aneurism a pulsation was strictly felt, although authors, in general, consider'd that as a pathognomonic sign. For if the blood is coagulated in the aneurism, no pulsation is perceiv'd."

And he added, that he had had experience of the same in large aneurisms, and produc'd an example of that large aneurism, which beginning from the trunk of the aorta, about three inches above the heart, occupied the exterior parts of the thorax, like a pillow; an aneurism very much similar to which, Littre (*f*) describ'd afterwards: but both of them observ'd, that, for some space of time before death, the pulsation was entirely obscur'd, and that this obscurity was to be accounted for from the quantity of lamellæ, which I have spok'n of before (*g*), or rather of polypous concretions, which the blood that stagnated internally still more and more increas'd. So, therefore, the observation of the pulsation being obscur'd, is transferr'd from external aneurisms to them also, which, although they had made way for themselves outwards, yet belong'd to the internal trunk of the aorta; and after that to those also, which are altogether conceal'd; for Lancisi speaks in general, in the

(*a*) Vid. Epist. 39. n. 19, 20.

(*b*) Epist. Anat. 13. n. 4.

(*c*) Oper. l. 6. c. 32.

(*d*) Vid. Anat. Chir. Obs. 38.

(*e*) Ibid.

(*f*) Mem. de l'Acad. R. des Sc. A. 1707.

(*g*) Epist. 17. n. 29.

fifty-eighth proposition (*b*), and Albertini also (*i*), where he takes occasion to speak of the pulsation of aneurisms, if not as entirely deficient, yet at least as being become much less, and languid. But although each of them are then speaking of the disease, when it is already inveterate, and touch upon other causes, moreover, besides that which I have spoken of; yet nothing, perhaps, is a sufficient objection against the same cause, very soon intercepting the pulsation in some, that is the blood, which was at length found to be concreted all round, in the aneurisms of Paulucci, and Ferrarini, and which began to coagulate very early, and thereby interpose a pretty thick obstruction, or bar, betwixt the hands of the physicians when laid upon the thorax, and the pulsation, which was certainly more distant from them at that time. You, therefore, readily perceive, how it could be, that although there was in each of them an aneurism, yet no pulsation occur'd in either.

But how it could happen, that though the disease was always present, there were not always paroxysms, is already explain'd in the former letter (*k*). You must not, therefore, immediately imagine, that because a pulsation is wanting, or because the more violent effects of the disease do not appear, through longer or shorter spaces of time, the patient has not an aneurism. I would not have you even trust longer intervals, unless all the marks of an aneurism go away at the same time with the paroxysms, nor those paroxysms now return any more, if the causes by which they were excited return; as, for instance, motion of the body, deglutition, and other things of that kind, which were wont in the two patients in question, and are wont in other patients like them, to renew the attacks of the disorder.

21. If you have, perhaps, hitherto wonder'd, that I, who had promis'd my own observations in this letter, should rather have produc'd remarks, and animadversions, than observations; since out of five of those which I have describ'd, one only is mine, and the remaining observations from others; you will immediately cease to wonder, when you shall observe, that I choose rather after that (*l*), to defer the greatest part of mine, to other letters, and to communicate here those of others, indeed, but such as were unpublish'd, lest they should happen to remain in obscurity. But to prevent you being displeas'd with what you ought rather to receive kindly, those that I shall subjoin, you will have one and all from me. And I shall first give you one, which, when explain'd, will agree with the last, whether you would attend to the nature of the cause, or consider the great uneasiness in deglutition, or, finally, the seat of the aneurism itself.

22. I saw a trumpeter at Padua, as far as I can remember, in the year 1723, whom his art had, long before, thrown into an incurable aneurism, which occupy'd the internal, and upper parts of the chest. The more this increas'd, the more it increas'd the uneasiness in deglutition, and the difficulty of breathing; till, at length, the power of swallowing, being at first wholly intercepted, and then the power of breathing, the patient was of course carry'd off. Those parts of the body where the seat of the disorder was, being brought into the hall of the anatomical theatre, I saw the arch of the aorta,

(*b*) De Aneur.

(*i*) Opusc. cit. supra, ad n. 11.

(*k*) n. 27.

(*l*) supra, n. 13.

together with that large branch which gives origin to the right subclavian and carotid, so dilated, that it compress'd the aspera arteria, and œsophagus. And when the celebrated Vulpius there dissected this aneurism, I saw that its internal surface was occupy'd with a very thick polypous concretion, the structure of which, in this man, was like the structure of the others that I had seen before; so that, like an onion, it might have been resolv'd into curv'd laminæ, some of which were contain'd within others; but a great part of the substance thereof was hard, and of a yellowish white, so that it resembl'd nothing more than harden'd suet.

23. Freind (*m*) asserts, that a matter, "resembling suet," was sometimes found by Vesalius, within aneurisms, from the testimony, as it seems, of Adolphus Oecon. Which I do not find in his narration, either as it is related in the Sepulchretum (*n*), or as it is read, somewhat more at large, in the observations of Schenck (*o*): although nothing is more common, than to find polypous concretions like suet, lard, or fat; so that observers have often, both before and since, pointed out those concretions, either by the name, or by the resemblance, of these things: nor in the heart alone, but also, sometimes, even in aneurisms. So in that, which is suppos'd to be the very first that was dissected, I have taken notice, that the external part of the concretion was found to be, "in colour and appearance, not unlike hog's lard (*p*). So Lancisi (*q*) describ'd "a polypous substance, like lard," dispos'd into the form of an arch, "in that aneurism, the length whereof did "not exceed half the length of the aorta, where it is curv'd;" so that I do not see why Freind relates it in such a manner (*r*), as if "in the whole curvature of the aorta, something like lard included in a cyst," had appear'd to Lancisi: neither do I see why he says, that the large aneurism describ'd by Ruyfch (*s*), which may, in a great measure, be compar'd with another that Littre has describ'd (*t*), "had fill'd up the whole cavity of the thorax, without any external tumour." I confess these things are of little consequence, if you attend to the design of Freind, and perhaps are not all to be imputed to him; nevertheless, these, and other circumstances moreover (*u*), which I remark'd in a few pages, while I was upon another enquiry, give me a suspicion, that he trusted too much to his own memory, in writing, and should make you more cautious in reading him.

24. But as we have deduc'd the cause of the aneurism in Ferrarini, from a long, obstinate, and violent cough (*x*); so in the trumpeter, I think the same disorder ought to be attributed to the frequent and strong inflation of that instrument. For whatever violently, and for a long time, changes the natural motion of respiration, changes also the motion of the blood; so that being sometimes obstructed, and sometimes excited, if any part of a vessel be accidentally less strong than others, this part will at length be dilated, by its fibres being strongly press'd upon, and drawn asunder. For which reason

(*m*) Hist. Med. ad A. 1640. ubi de aneurysm.

(*n*) l. 4. f. 2. obs. 21. § 7. partic. 2.

(*o*) l. 5. obs. medic. 5.

(*p*) Epist. 17. n. 29. vid. Sepulchr. § cit. partic. 1.

(*q*) De Subit. Mort. obs. ultim.

(*r*) loco indicato.

(*s*) Obs. 38. cit. supra, ad n. 20.

(*t*) Ibid.

(*u*) Vid. epist. 17. n. 3.

(*x*) supra, n. 19.

Lancisi has observ'd, that others, in like manner, who play on a trumpet, flute, or fife, and blow hard into them, are often subject to aneurisms (*y*); and Albertini has taken a mark from an art of that kind (*z*), by which, join'd together with other symptoms, we may conjecture at aneurisms while they are yet latent. And the reason why all trumpeters, and all that are troubl'd with a violent cough, do not fall into these diseases, is either because a firmer structure of vessels, about the præcordia, or a slighter and less assiduous application, and agitation, or, finally, a less quantity, and a better condition, of blood, prevent the other distending or eroding causes, from being added thereto. So neither in all who are troubl'd with a violent cough, or who play on a flute, or trumpet, is an ulcer of the lungs brought on, or a close adhesion of them to the pleura, although both of these disorders were found, in two patients who had been accusom'd to use instruments of that kind, by those celebrated men Duisingius (*a*), and Fabricius (*b*), who thought that this observation would serve to encrease the number of those diseases, to which our Ramazzini has taught, that this kind of artists are liable (*c*), and indeed justly; but so that we must acknowledge some of these to be more expos'd to disorders of this kind, than others, according to their various disposition, and constitution.

But as to the deglutition being troublesome, and at length entirely obstructed, in the trumpeter, which is to be accounted for, from the bulk, position, and seat, of the aneurism, compressing the œsophagus, in this manner; the circumstance is not only manifest of itself, but is also confirm'd by other examples, that are produc'd above (*d*).

Last of all, as to the seat of the aneurism, in the very curvature of the aorta, it so frequently happens, that aneurisms are found either in that place, or near to it; so that if you begin with that which was delineated by Riva (*e*), and certainly was the first that was delineated, as I have already said, and even with these, which you see are taken notice of in the Sepulchretum (*f*), from Lazarus Riverius, and Otto Heurnius, and go on to those that are describ'd by Ruysch (*g*), by Littre (*h*), and by others afterwards, which, for brevity's sake, I purposely omit, and then come down to mine, and compare them with all those others, that have been found in, or about that place which I have mention'd, how many soever you may read of, as having their origin from an internal cause, in other authors, you will wonder, without doubt, that all the parts of the aorta have so seldom grown out into an aneurism, into which, that one part has so frequently been form'd. The cause of which difference, as I have treated slightly of it heretofore, in the Adversaria (*i*), I will not repeat here; especially as I see that it was afterwards approv'd of by learn'd men, and among these by Valcarenus (*k*), who shews

(*y*) De Aneur. propof. 39. & 55.

(*z*) Opusc. cit. supra, ad n. 11.

(*a*) Commenc. Litter. A. 1741. Hebd. 44. n. 1.

(*b*) in Propempt. edito Helmst. A. 1751.

(*c*) Diatrib. de morb. artif. c. 37. vers. fin.

(*d*) n. 17. & epist. 17. n. 25. & 26.

(*e*) Ibid. n. 29.

(*f*) 1. 4. f. 3. obs. 21. § 10. & 1. 2. f. 5. obs. 8.

(*g*) Anat. chir. obs. 37. & 38.

(*h*) Mem. de l'acad. R. des Sc. A. 1707. & 1712.

(*i*) II. animad. 41.

(*k*) de Aort. Aneur. obs.

that it is confirm'd by Freind, and by Michellottus. - I will rather add two things. The first, that with how much the greater force the blood is impell'd by the left ventricle of the heart, into the curvature of the aorta, that lies near to it, with so much the greater force, is the blood repell'd into both the nearest parts of the aorta, by the curvature, when, soon after, it contracts. But as it is more easily receiv'd into that part which descends, than into that which ascends from the heart, inasmuch as it is far shorter, nor opens into branches, and is also shut up by the semilunar valves; it follows hence, that if an impetus is to be made upon one part or other of the artery, it will rather happen on that part, and consequently aneurisms are wont to be found in much greater number, betwixt the upper part of the curvature and the heart, than in any other part that is near to it.

The second, that although the end of the trunk of the pulmonary artery is not more distant from the right ventricle of the heart, than the curvature of the aorta from the left, and although that trunk seems to be no more able, in proportion, to resist the strength of the right ventricle, than the trunk of the aorta does the left; yet much fewer aneurisms are found in that trunk of the pulmonary artery, than in the arch of the aorta, doubtless by reason of the different position of the trunk of the pulmonary artery, which does not lie so directly in the way of the stream of the blood, when driv'n against it, nor yet so violently and suddenly infects that stream into a different direction. But let us go on to other observations.

25. A native of Beluna, in the territories of Venice, who was about fifty years of age, and whose business was to shear woollen cloth, with shears that were pretty large, indeed, but not the largest, and most heavy, began a year before to have a tumour arise in the right and upper part of the chest, whether drinking, to which he was much addicted, gave occasion to it, or the venereal disease, or rather both of them together, being added to the business in which, as I have said, he continually exercis'd himself. For what inconveniences had preceded, or what had afterwards succeeded, it was not in my power to know, except that at least, from the time he return'd to Venice, which was about the beginning of October, in the year 1707, he was troubl'd with a difficulty of breathing, whether he walk'd or spoke; which, however, neither attack'd him by paroxysms, nor threaten'd suffocation, nor broke his sleep: and this would have been readily refer'd to the man's trade also, especially by those to whom the experiment made by Kerckringius (*l*), in the shop of some artists of this kind, was known and approv'd. But besides this, he could now eat and drink but little. His face was tumid, and of a brownish red; his voice obscure and hoarse; his spitting thick; and the pulsation of the tumour was sometimes seen, or at least before the last twenty days, was very evident, even at a distance. This man, about the beginning of the December following, having spent the former part of the night among his fellow-servants, according to custom, and having talk'd with them, went at length to bed, saying that he should soon go to sleep; but a little after, he was found in a dying condition, with a stertor, and a foam at his mouth and nostrils; and thus within about about four hours he died.

(l) Vid. in Aët. N. C. Tom. 5. Schol. ad obs. 85.

The face of the body was turgid and livid; the hands and feet not tumid; but the præputium and the glands were swell'd, livid, and had a putrid smell, as if they were inclin'd to a gangrene; but when Santorini and I would fain have examin'd the urethra, neither time, nor place, nor, perhaps, the persons who were present permitted us. Wherefore the belly being open'd, and the liver, and spleen, being observ'd to be pretty hard, and the latter of these viscera also to be larger than the natural size, our whole attention was turn'd towards the thorax. And, externally indeed, in that part of the chest which lies between the right axilla and the sternum, a tumour was prominent, of a hemispherical figure, but depress'd, reaching from the fourth rib, to the clavicle, but nearer to the sternum than to the axilla; if you press'd upon it, it yielded, so as immediately to show you that scarcely any bones, or cartilages, now remain'd; which, in that part, naturally lie betwixt the muscles, and the cavity of the thorax. And, indeed, we found the clavicle to be displac'd, and corroded, internally, with a caries; and that part of the four upper ribs, in particular, which us'd to continue long cartilaginous, we found to be corrupted, or consum'd by the aneurism, the magnitude of which exceeded that of a kid's head: the figure of the tumour was nearly oval, and the seat of it was extended from the basis of the heart, to the upper part of the thorax. But the aneurism was like a sac, the left side of which, by a foramen that admitted two fingers, communicated with the right side of the aorta, before it gave off the common beginning of the right subclavian, and carotid arteries. This sac seem'd to be form'd of the produc'd substance of the aorta, but was more white, tenacious, and dense, and not less thick. This substance was internally invested with many curv'd laminæ, folded one within another, seemingly fibrous, and really polypous, but without moisture: and these laminæ contain'd such a quantity of blood, within their circumference, and this almost concreted, that being taken out from the cavity, together with those polypous laminæ, and put into the scales, it weigh'd forty ounces. The aneurism, by its bulk, had driv'n the right lobe of the lungs backwards, and more downwards than usual; so that it seem'd to be made less by the compression. This lobe being cut into, a white pus was seen to come forth, here and there, from the bronchiæ that were cut asunder. The left lobe was sound. Yet in each cavity of the thorax, but more in the right, was a quantity of yellowish serum, which had a kind of mucous pellicles, mix'd with it.

The pericardium also adher'd to the heart, on all sides, by a mucous, and yellowish substance of that kind. In the right auricle of the heart, and its annex'd ventricle, was a polypous concretion: in the pulmonary artery was blood: but in the left ventricle, neither one nor the other. Finally, the aorta descendens was internally unequal in some places, and had marks of ossification, beginning, as it were, by a kind of tendinous hardness.

26. Although many things were found in the thorax of this man, which as they made his breathing difficult, whether he walk'd, or even only spoke, so by the addition of any little circumstance, they might entirely intercept respiration, that is, might suffocate; yet if you choose rather to suppose, that by an obstruction lying in the way of the blood, as it return'd from the brain, something of an apopleptic disorder had moreover come on; from considering

sidering the seat of the aneurism describ'd, I shall not be very repugnant to your opinion. For it was seated in such a manner, that it might press upon the trunk of the superior vena cava, especially when the patient lay down, and perhaps on the right side: in which situation, without doubt, it press'd upon that trunk, not only by its bulk, but also overloaded it by its weight; and both these properties were encreas'd so much the more, as the aneurism, at that time, admitted more blood; inasmuch as being carried down through the trunk of the aorta, from the anterior, into the posterior part, not the ascending trunk in a recumbent posture, but rather the descending, so that it enter'd the orifice of the sac itself, and distended it, perhaps, so as it had never been before distended, either because the parietes of the sac were at length reduc'd to such a state, as to yield more; or rather, because there was either a greater turgescency of blood that night, or a greater quantity, by reason of a greater quantity of wine being taken in, than usual, or by reason of insensible perspiration being suppress'd, as it was then a cold season. These circumstances, therefore, you will suppose in any manner you please, since the stertor, the foam at the mouth, the turgid, and livid face, agree very well with both kinds of disorders.

27. But as to the consumption, or corruption, of the bones and cartilages, nearest to the aneurism, such as I found in the man, whose history I at present treat of, and in others, this appearance frequently occurs in dissection, whether an aneurism had succeeded to a violent contusion, as in the lieutenant, of whom the celebrated Christian Vater (*m*) speaks; or, to omit other, and more ancient examples, and to produce one more similar to mine, in a man whom the celebrated Schreiberus (*n*) describes, where the ribs and cartilages were consum'd with a caries, and the muscles cover'd the aneurism, which was ruptur'd beneath them; or without any previous blow, as in a young man, of whom the celebrated Fackius (*o*) gives a history, the dilatation of the artery had taken its rise from too acrid a state of the blood, and its increase, from too great a motion of the body and arms, in playing at tennis, and had brought on a corrupt state, in the neighb'ring clavicle. You, however, will account for the caries, and consumption, that I saw in the ribs and clavicle, either from the pulsation of the contiguous aneurism, or its corrosive ichor, as you shall think most proper; although even the pulsation, where it hollows out the parts into a caries, does not act without an ichor of that kind. For the small vessels of the periosteum, and perichondrium, and other vessels of any kind, as, for instance, of the pleura, that is stretch'd out upon these parts, being plac'd between those resisting bodies, and the aneurism, which is continually and vehemently pulsating; and being, for that reason, contus'd, and extenuated, are at length easily ruptur'd here and there, and produce a kind of little ulcers, very small indeed, and almost escaping the senses, yet pouring out a moisture, betwixt the lamellæ of these membranes, which, by stagnation, contracts an acrimony, and a power of eroding, and that very considerable too, especially in some particular constitutions: and this I would have you believe also, of the vessels which creep through

(*m*) Eph. N. C. Dec. 3. A. 9. obs. 162.
tom. 3. inter phys. n. 4.

(*n*) Nov. Comm. Acad. Sc. Imp. Petropol.
(*o*) Eph. N. C. cent. 5. obs. 74.

that part of the parietes of the aneurism, which is urg'd against the resisting bodies. But the eroding ichor is not always the effect of the aneurism, as I have now explain'd, but even sometimes a cause, as I have hinted in a former work (*p*), and the very ingenious Lancisi afterwards explain'd, in many different ways; to wit, either from acrid humours, being obstructed betwixt the coats of any artery, in a part where it has been struck, as in those aneurisms which, as I mention'd before, succeed to blows and contusions (*q*); or from a corrosive ichor, stagnating in the same part, without any previous external cause, as in those which arise in hypochondriac, scorbutic, and hysteric bodies (*r*); or even from an ichor distilling out of the neighbouring parts, that are eroded, upon the parietes of the artery, as in those which happen near the bones, that are already affected with a venereal caries (*s*). Yet I do not doubt, but the corrosive particles that contaminate the humours of those who are infected with a venereal lues, as they discover themselves by stagnating in other parts, that are by no means bony, so I do not doubt, I say, but they frequently stagnate, in the coats of the arteries also, in the same manner nearly as Lancisi has said in hypochondriac, hysteric, and scorbutic constitutions, and weaken these coats by corroding them here and there, and in that manner, render them more liable to dilatations. And indeed, I have often found manifest marks of erosion, in the coats of the aorta, especially where this lues existed, as I have said in a former work (*t*); for sometimes, even where it was not, I have found the coats cover'd over internally, here and there, with bony scales. But these observations I put off to other occasions (*u*), when it will be more proper to produce them. And those which I shall produce now, although they will not be without these scales; yet they will relate to that subject which our order requires, to the aneurisms of the heart, for instance, and of the aorta, at the same time.

28. When I resided at Bologna, in the year 1702, I had often heard an old woman, who was almost eighty, complaining of her stomach; for it is thus that the common-people are wont, in that place, to mark out the lower part of the thorax. Her pulse was extremely tense and chord-like; and the difficulty of breathing so great, that she was oblig'd to sit up in her bed; which, however, grew less violent, sometimes, by taking fresh-drawn oil of almonds. At length, it increas'd so much, that the woman was suffocated: The thorax being open'd, a large quantity of water was found in its cavities; and in the pericardium was still more, in proportion to the cavity, so that this bag was greatly distended. The heart was of such a bulk, so thick in its parietes, and had its cavities so much enlarg'd, that it seem'd like the heart of an ox. In each of these cavities were large polypous concretions, that reach'd into the vessels. The aorta was greatly dilated, quite from the heart even to the first orifice of the superior branches, and, in almost that whole tract, cover'd internally with bony scales, which resembl'd nothing more than thickly-strown drops of white wax, after they have grown cool upon the floor. The left lobe of the lungs, especially in its inferior part, was very lax, and

(*p*) Advers. 2. Anim. 41.

(*q*) De Aneur. Propos. 20. & seqq.

(*r*) Ibid. Propos. 30 & seq.

(*t*) Ibid. Prop. 32. & seq.

(*i*) Animad. indicata 41.

(*u*) Epist. 26. n. 17. & Epist. 27. n. 2, 22, & seqq.

half-corrupted, just as if it had been, for a long time, macerated in water, as anatomists sometimes do.

29. You will read a history in Malpighi (x), much like this in many respects, whether you attend to the state of the pulse, or the quantity of water in the pericardium, or the dilatation of the chief cavity of the heart, and the aorta, and the bony scales that had been form'd upon it internally. Which three last circumstances you will also find in the two following observations that I shall give you. But before I produce these, those three circumstances, and the two others, likewise, that are before-mention'd, afford me an occasion of throwing in something in regard to the opinion of a celebrated man on the cause of aneurisms, and of bony scales therein. He thinks; that the cause of both these accidents may consist in the caries of the bones; but it is explain'd in a manner far different from that in which I explain'd it just now (y). That is to say, as many arteries are contiguous to bones as to fulchra, if a caries happen to hollow out the bone, the resistance of the fulcrum being there wanting, that the artery becomes prone to dilatation, and to conglutination with the carious bone, and by reason of the bony juice distilling from this bone, even to the production of little bony concretions. It is easy to suppose, that, if what happen'd to the celebrated Targioni (z) had also happen'd to this writer, that is, if he had seen a great cavity hollow'd out in the vertebræ of the thorax, and the vena sine pari lying close to it, in a very varicous state; it is easy to suppose, I say, that he would have rather consider'd the cavity in the vertebræ as the cause of the varix, contrary to what Targioni suppos'd, whose opinion you would much more readily give into, if the varix had begun at a time when the vertebræ, on account of the patient's age, had not as yet ceas'd to be capable of impression. However, I willingly allow, that the opinion I have mention'd, as far as it relates to some peculiar dilatations of the arteries, may sometimes possibly take place, in some measure at least, as in the carman, whose history is giv'n in the former letter (a), and still more in that case, on occasion of which that opinion took its origin; for there were, in the posterior surface of the aorta, a kind of hemispherical tuberosities, answering to the pits or cavities, which being hollow'd out, in the contiguous bodies of the thoracic vertebræ, receiv'd, each of them, one of these hemispherical dilatations. Yet the aorta was also dilated on its anterior surface, nor was this surface without these hemispherical dilatations; neither of which circumstances could be the effect of these pits, or cavities, in the vertebræ. Thus I have at present by me, in a dried state, the aorta, from a certain man, with an oblong aneurismal sac, which began to arise before the superior branches emerg'd therefrom; and from that beginning of the sac, a peculiar hemispherical dilatation was prominent, which had sufficient capacity to admit the lower part of the thickest thumb: and this tuberosity, as the seat of it, that is pointed out, shews, was certainly in the neighbourhood of no bone. But as to the sac, which I have describ'd in the native of Beluna (b), contiguous to the corrupted clavicle and the ribs, shall we say, that it had its origin from the cause of

(x) Epist. de Struct. Glandul.
(y) N. 27.

(z) Prima Raccolta di Osserv. Med. pag. 22.
(a) 17. n. 17. (b) Supra, n. 25.

this corruption, notwithstanding its first origin was, in like manner, from that part of the artery, which is so very distant from those, and from other bones? Besides, you have read in the history of the old woman above, and in others, also, you have read, and will read, that there have been aneurisms in the same part of the aorta; and that there have been, to speak of these also, bony lamellæ. Shall we, then, account for these from the bones that are distant and sound? to say nothing of the bony juice, which is also call'd into question, by the late experiments of Du Hamel (c), even where it was believ'd to flow from broken bones; so that if you are of his opinion, it seems, that it ought still less to be accounted for from carious bones. But in regard to the origin of bony lamellæ in the arteries, I will presently take into consideration some other circumstances, after having given you another observation, which I made, as I did the last, at Bologna, two years after that.

30. A man, whose uncle had been carried off by a hidden disorder in the thorax, join'd with a great pulsation, being immoderately given to venery, and to feasting, especially when he was young, and, when he was more advanced in life, being troubl'd with heavy cares, and violent affections of mind, began, first, to feel a like pulsation, and in the intermediate time, began, moreover, to draw his breath with difficulty, when he walk'd through even places, but still much more when he went up steep places. This difficulty of breathing was so very strong, almost every month, in the manner of a peculiar paroxysm, that the man seem'd to be in instant danger of suffocation, if blood was not speedily taken away; for by this means he was eas'd. At length, he was seiz'd with a slight fever, on which occasion his physician particularly observ'd, that his pulse was extremely different from a natural state; nor yet did it even agree with that fever, inasmuch as it was vehement, and very chord-like, especially on the left side. He immediately ask'd, whether he felt any pulsation in his chest? for the patient had been silent upon this head, notwithstanding it had been of long continuance, as I have said, and was so great, that if the hand were applied to the left nipple, it was often violently urg'd, and in a manner repell'd. And now he could not breathe except with his neck strait: a bloody kind of expectoration was discharg'd also, but in a very small degree. Blood being taken away, to the quantity of two ounces, and no more, that fluid seem'd to be in a very good state. In the mean while, the patient became gradually very lean, like a hectic person; and yet not in a very great degree. His feet were œdematous, his strength was decreas'd, his pulse became lower, but did not lose that chord-like vibration, and the pulsation, also, under the breast, continu'd. And even about the fortieth day from the time the fever had attack'd him, and an hour before his death, this pulsation was, to the full, as considerable as ever it had been.

The abdomen had scarcely any appearance which was not natural, except that the spleen, though of its proper magnitude, was hard, and very black. In the thorax no water was collect'd, nor yet in the abdomen, or pericardium. But the heart was extremely large, and the veins that crept through its sur-

(c) Mem. de l' Acad. R. des Sc. A. 1741.

face were dilated, and in a manner varicose. The right ventricle being cut open, in which was a small polypous concretion, and the left ventricle, in which there was no such appearance, all the parietes of the heart were found, in general, to be thicken'd, and both the ventricles to be much dilated, but the left still more than the right, in which I observ'd the valvulæ mitrales to be almost three times as large as usual, and the columnæ, to which they are tied, to be much enlarg'd. The aorta, also, from the heart quite to the neighbourhood of the emulgents, was much broader than natural, and, through the whole of this tract, was rigid and inflexible, by reason of bony lamellæ, which were form'd on its internal surface. While these appearances, that I have mention'd, were examin'd into, and the heart was separated from its vessels, a great quantity of black and half-concreted blood fell out of them, an oblong cylinder of which was drawn out of one of those vessels, that is, from the superior vena cava, just like a sword from a scabbard. The lungs, upon cutting into them, appear'd to be variegated, and overflow'd with a kind of frothy humour, and were found to be, when you touch'd them, almost of a tendinous hardness.

31. As the blood was driv'n very violently, by the strong parietes of the heart, into the aorta, which was, perhaps, more easily dilated therefrom, by reason of its being somewhat weak; for that disorder in his uncle seems to prove something of an hereditary tendency; and as the blood could not be driv'n forwards, as it ought to have been, by the aorta, that was already dilated, and afterwards become rigid; there is no doubt, but the blood must necessarily, in part, stagnate in the neighb'ring ventricle, as I have also said elsewhere, and of courie distend it considerably; although the right ventricle must, also, have been distended in like manner, but in a less degree, by the blood being "successively and mediately" retarded therein, and in the vessels of the lungs, from the same cause, notwithstanding it acted with less violence. From these circumstances, therefore, and from the increas'd weight of the heart overloading the diaphragm, you can account for that difficulty of breathing, and those bloody expectorations: and from the efforts of both the ventricles, which were so much the greater, as the more blood was to be expell'd into passages already obstructed with stagnating blood, you will, perhaps, account for the hardness and rigidity of these passages, the first of which discover'd itself in the dissection of the lungs, and the other in that of the aorta. If you chuse to account for them thus, you will then adopt the doctrine of Boerhaave (*d*), which has already been adopted by many, who suppose it to be owing to perpetual, and too strong motion, that the parts become not only more hard, but even bony, through old age, and a laborious life. For whether, through a very long space of life, the smallest particles of the vessels are strongly impell'd, and compress'd, so that the vessels are render'd impervious, and at length entirely destroy'd; or whether the space of life be more short, and the vessels are more strongly urg'd; you will very easily conceive of their hardness, and in fine their bony rigidity. But as I know that many eminent men have, nevertheless, dissented from this doctrine, and that one of them, whose disputation is now in my hands,

has giv'n us the reasons, and, in particular, the observations, which have induc'd him to dissent, and which, as I shall shew hereafter (e), agree in some measure with mine; it becomes you, I think, to proceed here with some caution and distinction.

32. In the first place then, it cannot be denied, that the parts of the old are harder than the parts of the young, since it is not only confirm'd by anatomists, that even the brain of old persons is more hard and firm (f) than that of young persons; but no one is ignorant, with how much difficulty the flesh of animals, when old, is made tender by the fire, masticated with the teeth, or digested by the stomach. And it seems to me not ridiculous, to account for this hardness, in the manner that Boerhaave thought it was to be accounted for. Nor is there any great reason, in my opinion, why we should not ascribe, chiefly, to the same cause, that some of the ligaments, membranes, and tendons, in old subjects, and even part of the muscular substance of the heart, as has been found by others (g), and even sometimes by myself also (h), have become, in like manner, rigid and bony. Now it is very evident, that the arteries consist of membranes, and muscular fibres. It seems, therefore, that the same reasoning might take place in regard to these also, if they do, at any time, become bony in this manner: but we must account for it in another way, if they have degenerated in a different manner. And that this degeneracy does more frequently happen, in a different manner, I cannot deny, when I consider the disjunction of those little scales, that the question turns upon at present, and the other appearances, which I observ'd together with them. But though I readily make this confession, I still as readily believe that ossification does sometimes really happen, in the manner before mention'd. For I cannot see any reason utterly to deny, that what we acknowledge to have happen'd in the other coats and membranes of the body, did ever happen at all in the arterial coats. Nor is it any objection, that the middle coat is muscular, and constantly employ'd in alternate contraction, and relaxation, since, as I have just now said, we know that the fleshy substance of the heart itself has become bony. Nor do the web-like cellular membranes, that are every where interpos'd betwixt these coats, afford any argument contrary to this doctrine; for they being naturally compress'd, between these coats, do not appear in the form of a cellular texture, unless, in consequence of distraction, or by the help of injected air: for which reason, they do not sufficiently preserve the vessels that pass through them to go into these coats from compression; and indeed we frequently see, that membranes in other parts of the body, notwithstanding they are surrounded with cellular texture of the same kind, do, nevertheless, degenerate, and become bony: although I do not so much consider here the vessels going to these coats, as the ultimate ramifications dispers'd through their internal substance. But that the vessels also, which go to the coats of the arteries, may, even in this very cellular texture, be squeez'd together through age, and coalesce, Boerhaave has pointed out from Ruyfch (i), by considering, on

(e) Epist. 27. n. 21. 22.

(f) Vid. apud Haller in extrema ad cit.
Boerh. § Adnot.

(g) Ibid.

(h) Epist. indicata. n. 18.

(i) Prælect. cit. ad § 471.

one hand, the arteries of foetusses after injection, and on the other, those of adults, and by comparing the vessels of both: and the same has also been confirm'd by the illustrious Haller (*k*). Nor, indeed, is the very soft and cellular texture of the lungs, capable of exempting the vessels of that part from disorders of this kind, since an example is on record (*l*), where "the arteries in the lungs, and their branches, were entirely bony."

For that the veins also become bony, against whose parietes the blood does not bound with so much impetus, as against the parietes of the arteries, or that these do not always begin to become bony near the heart, where they are urg'd more forcibly by the blood, doubtless happens much more seldom; nor is it to be wonder'd at, if from other causes, the same thing sometimes happens to the veins, which happens also to other membranes of the body; or if certain tracts of the arteries, either from a natural tendency in themselves, or from a peculiar habit of living, or from some more frequent situation of the body or limbs, have their internal vessels more dispos'd to receive compression from the blood which distends the arteries. And as this disposition may have existed from the very birth, even in the small particles of the arteries here and there, or in the external lamellæ of the internal coat, more than in the internal lamellæ; so it may, in like manner, happen from this cause, that there may not be a continuity of ossification, or that the inner surface of the internal coat, although more expos'd to the impetus of the blood, may itself not become bony, when that which this internal coat covers is already become so.

33. But if you should not be sufficiently satisfied with some of these arguments, which I have produc'd, rather that you may be excited to produce better, than because I am well pleas'd with them myself (and indeed you will perceive elsewhere (*m*), that I do not ascribe much to the greater part of them) yet I do not think that we must immediately give up the point, and confess that the arteries do never degenerate into a bony nature, in the same manner that tendons, and some other parts do. For what if, sometimes, even the whole internal coat itself, what if the whole artery should be chang'd into that state? Falloppius (*n*), for the ancient anatomists were not ignorant of this kind of degeneracy, having observ'd, long before Steno, "that old birds have their muscular chords become bony, by reason of too great exercise and labour, but that the chords of younger birds are soft;" expressly asserted at the same time (*o*), "that he had seen, in a certain old woman, all the arteries on the left side degenerated into bone." And Coiterus (*p*), moreover, has written thus of Falloppius, "that men worthy of credit had related to him, at Bologna, that they had seen, in a body dissected by Falloppius, at Padua, the aorta, or great artery, universally bony." And, without doubt, that portion of the descending aorta must have been altogether bony, which was taken by Harvey from the carcase of a nobleman, together with the two "crural branches, to the length of a span (*q*);" for he says, "that the coats of the artery were totally converted into a bony

(*k*) ad earund. §. 467. not. 2.

(*l*) Eph. N. C. Dec. 2. A. 3. obs. 38.

(*m*) Epist. 27. n. 21. 22.

(*n*) De Partib. Similar. c. 10.

(*o*) Ibid. c. 14. (*p*) Obs. Anat.

(*q*) Exercit. Anat. 3. de Circ. Sangu.

"tube, or pipe;" nor, indeed, if any of the original coat had remain'd, would his argument have had its force; I mean, "that by reason of the solidity of the bone, the pulsfic faculty could not be carried through the artery." I omit other observations, since in this Harvey has said as much as is sufficient, to prevent us from easily conjecturing otherwise, by reason of his silence, and still more, to prevent us from arguing or demonstrating the contrary. Thus much have I said on this subject, not for the sake of discussion, but only that we may for a while with-hold our assent, till the truth, at length, more clearly discover itself to our researches. Now let us go on to the remaining observation of the dilated heart and great artery.

34. A woman, seemingly about forty years of age, rather of a fat habit, who had been accusom'd to earn her bread by washing linen, having been frequently brought into the hospital, within her last six years, on account of a difficulty of breathing, that had the appearance of a convulsive asthma, at which time, not the least pulsation could ever be perceiv'd in the wrists; return'd to the hospital, on the same occasion, and died within fifteen days, having spit up, in the last moments of her life, as was related to me, a thick and purulent matter.

The body of this woman being brought into the theatre, for public demonstration, I examin'd into its appearances. There was no tumour on the external surface, not even at the feet, nor any other mark of disorder. But the day after her death, when the integuments were remov'd from the abdomen, the muscles began to look green; the next day still more, and even to have a most filthy odour: yet the viscera of the belly, when soon after laid open, did not appear livid, or with any marks of disease. Yet a little after the stomach, the omentum, the mesentery, and some other viscera were taken out, they all began to be livid, and to have a very ill smell: and the next day the pancreas was ting'd of a dirty green colour, so as to resemble any thing more than the pancreas, when in its natural state. And in the mean while, not only the theatre, but almost the whole college, was fill'd with a vehement, and almost intolerable stench, notwithstanding the weather was cold, and very snowy in those days, which immediately preceded that very great vehemence of cold, which began on the tenth of February, in the year 1740. Although, for these reasons, it was necessary the body should be soon taken away and buried, yet I was resolv'd that the integuments should be previously incis'd, in both wrists, to see whether there was any artery in the place where physicians generally are wont to look for it, or whether it was only small, or by any means obstructed, and that the thorax should be laid open, to enquire into the seat of the disease.

And an artery there was in each wrist, such as is generally found. Nor had the thorax any effus'd humour contain'd in it; nor was the pleura any where connected with the lungs: though these last-mention'd viscera were, indeed, turgid with a frothy fluid in every part; yet shew'd no other morbid appearance, either internally, or externally. But within the pericardium, the heart was found to be pretty hard and thick, being, in a manner, tendinous, and much enlarg'd. Upon dissecting the heart, I observ'd that this enlarg'd state of it, and the great capacity of the ventricles, was not join'd with an extenuation of the parietes, which were rather thicker than natural.

In

In both of the ventricles, were thick and whitish polypous concretions, but especially in the right, from whence a very long one extended itself, through the pulmonary artery: yet these polypi were not harder than the crust which forms itself on the surface of blood, when congealing in a basin after its emission, and were easily pull'd into pieces. These being remov'd, I examin'd the internal surface of the ventricles with diligence, together with the valves, the auricles, and great vessels, and found that every thing had the appearance of health, except what I am going to relate. The sinus added to the left auricle was larger than usual, and more unequal, on its internal surface. The *aggeres*, as Valsalva calls them (*r*), of the valves of the aorta, were here and there thicken'd, especially in two; as they also were in one of those, which are plac'd at the beginning of the pulmonary artery. When I look'd upon the valves of the aorta, it was easy to perceive, that besides the two orifices, from whence begin the two coronary arteries, there was a third over and above; nor that at the side of the right, but of the left orifice, and of such a size, that I do not remember ever to have seen that which I have describ'd in another place (*s*), at the side of the right, of so great a magnitude. But it was much more easy to perceive, that the great artery was dilated from those valves, even almost to that very part, whence the inferior intercostals arise. Which was not less manifest, than that the coats of it were, in that whole tract, thicken'd and grown hard, being on its internal surface, in many places, yellow, and shewing signs of its approaching change into bone, such as the beginning of one of the subclavians, in like manner, exhibited. And as soon as ever the aorta could be call'd descending, it had, internally, some small, but truly bony laminæ; and in the same part, its fibres seem'd as if they had been drawn asunder, and that to a considerable distance from each other. Last of all, where it approach'd to the diaphragm, it seem'd to be mark'd with a kind of furrows, drawn in the longitudinal direction of the artery.

35. But as to these furrows, I shall speak of them elsewhere (*t*); for I have observ'd them in other subjects. And in regard to that unaccustom'd disposition to putrefaction, which the viscera, and especially those of the belly, had acquir'd; or in regard to the pulse, which could not be felt in the wrists, I have nothing to say, unless you will, perhaps, attribute this latter effect to convulsion (*u*), and the former, to that very malignant fever, which had lately been join'd to the other disorders. But whether the expectorated matter that was discharg'd just before death, was also purulent, or only had the appearance of purulency, I will not take upon me to determine.

One thing, however, I will endeavour to explain, which I have not yet thrown any light upon, notwithstanding it is mention'd in the two former histories (*x*), as well as in this: I mean, how it could happen, that although the ventricles of the heart were so much dilated; yet the parietes of them were not diminish'd, but rather encreas'd in thickness; which a celebrated man, when he denies the preternatural augmentation of muscular flesh, even in aneurisms of the heart, seems either not to have seen, or not sufficiently to have attended to.

(*r*) Diff. anat. 1. n. 10.

(*s*) Epist. anat. 15. n. 8.

(*t*) Epist. 24. n. 34, 37.

(*u*) Ibid. n. 7. in fin.

(*x*) n. 28. & 30.

When the ventricles of the heart are affected with an aneurism, they do not expel all the blood into the arteries, and consequently, that portion which has remain'd in them, must be added to that which they receive from the veins. A greater portion of blood, therefore, will more resist that quantity of it, which is about to return from the substance of the heart itself, through many, but narrow passages, into the ventricles: for which reason, this part of the blood, stagnating within the parietes of the heart, will render them thicker. But if an aneurism of the ventricles be join'd with an aneurism of the aorta, as in these three, of which I spoke last; this circumstance will moreover be added, that as the aorta cannot then carry on the circulation, in the manner it ought, so as to take off the load of blood from the heart, a greater quantity thereof will presently be repell'd into the mouths of both the coronary arteries, when the aorta contracts itself: and for that reason the parietes of the heart will, at the same time, receive more blood than usual, and expel less, so that the thickness of their substance must of consequence encrease, from a double cause: and that so much the more, if either the passages through which they throw out the blood, are naturally narrower, or fewer, or the orifices through which they receive it are greater; or, as in this woman, sometimes in greater number.

Nor yet will the parietes of these cavities grow thicker, in all, whose ventricles are dilated, but in some will even be extenuated, either because the diameters of those emissaries, and immisseries, are not quite the same as, or are quite contrary to, the original formation; or even, because the structure of the fibres is sometimes naturally more lax, and for that reason, more prone to yield, and at other times, from eroding juices, a great quantity of which will dissolve the tender fibrillæ, whereof the larger fibres are compos'd, or whereby they are connected one with another.

36. It is long since, as you very well know, that I sent you this explanation. In which, I now see there are some things, that do not very well agree with the observations of that illustrious man, Senac, especially where he enquires (y), whether orifices do really open on the internal surface of the ventricles of the heart, and discharge blood into those cavities, as so many celebrated men might seem to have demonstrated, who have been, in general, follow'd by others. I would have you, therefore, consider the subject well; and whatever parts of my explication you may think ought to be chang'd, or rejected, I would have you freely change, or reject. But when you shall peruse the writings of Senac, you will frequently light on other things, relating to this point. For they will confirm what the last-propos'd history has taught, that not all the aneurisms of the heart, and still less of the aorta, are attended with more vehement pulses, as some seem to imagine, and will give you more than one reason, why they may not be so attended (z), and consequently, why all aneurisms of the heart do not dilate the aorta (a); and when there is an aneurism both of the heart, and great artery, which of them seems to be the cause of the other (b); and by what signs each of them may be known, notwithstanding the pulsations are obscure (c): besides other questions of this kind; which although they have no less difficulty than utility, in their solutions, you will nevertheless find excellently solv'd, nor with less

(y) *Traité du Cœur*. l. 2. c. 5. n. 11.

(a) ch. 8. n. 6.

(b) *Ibid*.

(z) l. 4. ch. 4. n. 4. & ch. 8. n. 9. & 10.

(c) ch. 4. n. 4.

skill than ingenuity, as far as the nature of the question admits. Nor will many admonitions, and animadversions, be wanting, which may be very useful; as for instance, when you shall read (*d*), that the heart is sometimes dilated, and this dilatation is not seen, unless the cavities be fill'd: and that the same thing (*e*), unless you diligently attend to it, happens, sometimes, in the great artery, which is not dilated, laterally, into the form of a sac, but equally on all sides: and (*f*) that the dilatations of the auricles are an obstruction to the blood, as it issues from the ventricles, by compressing, either the aorta, or the pulmonary artery. To which you may also add, that an aneurism in either of these arteries, by pressing on the contiguous trunk of the other, will still more obstruct the exit of the blood; but by pressing on either of the auricles, or the veins that go into them, it will resist the return of the blood.

But to return to Senac, beside these few things which I have taken notice of among many, he has his own observations of aneurisms of the heart and aorta existing together at the same time; and these not as Lentilius (*g*) has them, without any peculiar symptoms, but even attended with almost all the symptoms that are peculiar, especially in the Marquis du Palais (*b*), amongst which also is the symptom that we consider'd above (*i*), as being join'd with other signs of the aneurism; I mean, that the patient could not lie down, but was compell'd to sit with his body bent forwards.

And you will read of this situation giving some ease in an old man also, join'd together with other signs of a long continu'd disorder of the heart (*k*), in whom the heart was "almost of a stupendous magnitude," and the great artery, immediately as it came below the diaphragm, was "extended to the size of a fist:" and this I should suppose was an aneurism, to which a polypous matter adher'd internally; for if it had been a membranous follicle, or apopleth, that had open'd itself into the aorta, rather than this should have discharg'd its pus into the aorta, as is suppos'd, the aorta must have impell'd its blood into this follicle, or apopleth, by reason of the stronger force with which that fluid is driv'n.

37. Although I have produc'd many examples to you of aneurisms in the aorta, and shall yet produce others in other places, and not only of them which consist in an almost equal dilatation of the artery, in every part, but of those also which grow out like a bag on the side of it; lest you should possibly believe, that these are very rarely met with, since it has happen'd, that no more than one example of this kind has been produc'd among all the observations both from Valsalva's papers, and mine, I have by me, at least, on the other hand, four aneurisms that were formerly stuff'd, and dried, by the celebrated Vulpus, all of which were either in the arch of the aorta, or in that tract which lies betwixt this arch and the heart; and one of them only is of the first kind, and three of the second. And these preparations I will shew you, if at any time you shall come to Padua, according to my wishes. In the mean while, farewell; and continue your present affection for me.

(*d*) Ch. 8. n. 2. (*e*) Supplem. ch. 3.

(*f*) L. 4. ch. 11. n. 2.

(*g*) Eph. N. C. Dec. 3. A. 3. in Append.

n. 3. ad Obf. 31.

(*b*) L. 4. ch. 8. n. 4, 6, 7.

(*i*) N. 18, 19.

(*k*) Aët. N. C. Tom. 3. Obf. 31.

LETTER the NINETEENTH

Treats largely of Suffocation, and slightly of Coughs.

i. **H**AVING sent you four letters on the subject of injur'd respiration, and most of them very long, I will send only this one on suffocation, and coughs. For as difficulty of breathing has a cough often join'd with it, and very often terminates in suffocation; I could not write on that subject without making mention of both these symptoms frequently, the one expressly, and the other obscurely. And the same must of course happen in other disorders of the thorax, to be treated of hereafter. You will therefore look for, in other places, what may seem to be omitted here.

Neither, indeed, are there a great number of observations, if those which are given in this second section of the Sepulchretum, of suffocation, and in the following section, of coughs, are compar'd with those contain'd in the foregoing section (*a*); for you will find that many are intentionally repeated, and some through carelessness. So that observation, which had been given under number twenty-one, is given over again, soon after, under number twenty-nine: and that which Bonetus himself had describ'd under number fifteen (*b*), is read again, in like manner, under number three, in the additamenta. And in the next section, number three, and the fourth article under number eighteen, are the same; number twelve and fifteen; the articles one and seven, under number seventeen; the third under eighteen, and the second under nineteen; number thirty, and article six, under thirty-seven; thirty-one, and eight, under eighteen; and, what would be scarce credible to any one, the two articles four and five, which lie immediately together, under number twenty.

2. But, as suffocation happens, not only from internal causes, but also from external, and adventitious ones, which I have not hitherto touch'd upon, I shall begin with this kind: and in the first place, according to my custom, I shall give you some observations of Valsalva's; to which, after a few of my own, such as they are, I will also subjoin some experiments made by him and by me. And then, passing over from this species to the other, which arises from internal causes, if I have any observations to communicate, I will first give you those that relate to suffocation, and afterwards those also which relate particularly to coughs.

3. A woman, of one-and-twenty years of age, was publicly executed at the gallows. The carcase about the back, loins, and buttocks, had the skin in some places reddish, and in others livid. The mouth was distorted, the

(*a*) i. l. i. i.

(*b*) § 1.

eyes half-open, and the face altogether livid; but this was presently chang'd into a pale colour, from opening the external jugular veins. For the blood had almost preserv'd its natural fluidity. The chest being open'd, it was necessary to loosen the lungs from the pleura, to which they adher'd in many places, on both sides; and the lower edge of the right lobe adher'd to the diaphragm also. The surface of the lungs that was turn'd to the back, seem'd to have been affected with a slight inflammation.

4. That the lividness of the face was owing to the stagnation of the blood in its veins, is confirm'd by the section of the jugular veins, which also shew'd, that the natural fluidity of the blood was preserv'd. And this being suppos'd, whatever was observ'd by Valsalva, both in the posterior parts of the body, and in the posterior parts of the lungs, is easily understood to have happen'd, from the time that the carcase being taken down from the gallows, was laid in a supine posture.

5. A highwayman, not more than two years older than that woman, was executed in the same public manner. In the carcase, that was given for public dissection, the face, in which the eyes were half-open, the arms, the back, and the buttocks, were in some places reddish, and in others appear'd livid. But internally, nothing was seen worthy of notice, except that the lungs appear'd in a manner red from inflammation.

6. But here, although the other appearances must be explain'd in the same manner, yet that which relates to the lungs, as it was not only seen on the back-part, should seem to be accountable for from suffocation, if the former, and the two following observations should admit of it. But the eyes being half-open in those two that are spoken of, and even in that which will be next spoken of quite open, do not much help forwards this remark of Garmanus (c): "That almost all, who are destroy'd by a violent death, have " their eyes cover'd with their eye-lids."

7. The eyes of a man, who was publicly hang'd, were open and turgid, and his face a little livid. In the abdomen, some chyloferous vessels were seen about the lumbar glands, in which they seem'd to terminate. In the thorax, the lungs, which adher'd to the pleura in both their lobes, but especially in the right, so that they could not be separated without great difficulty, were somewhat red on the posterior part. There were no polypous concretions in the heart. In the head, the sanguiferous vessels of the dura mater were somewhat turgid.

8. A slender, and middle-ag'd man was hang'd for many and great thefts. He had been subject at intervals, and especially in walking, to a difficulty of breathing, and a troublesome cough. The abdomen being open'd for public demonstration, some lacteal vessels were seen in the mesentery. And in the thorax, the lungs were mark'd with a kind of blackish spots, yet were unconnected with the pleura, except at the upper part of the right lobe; which was indurated to the bigness of an apple, and ting'd with a peculiar redness, just as if it had been inflam'd; for this part was strongly connected to the pleura, about the ribs, and opposite to the clavicle. In the pericardium was scarcely half an ounce of serum, and in the heart no grumous concretion.

of blood was found. In the neck, the compression of the halter had broken thro' the muscles which connect the os hyoides with the larynx, and the neighbouring parts; so that this bone was, of course, separated from the larynx. At length we came to the head. And the skin which cover'd the cranium was turgid with blood-vessels, on its internal surface. The brain, as far as could be obvious to the judgment of the senses, did not at all differ from the natural constitution. The muscles, and the other parts that lie about the eyes, seem'd to be in a manner inflam'd, from the stagnating blood; and the retina was, in both eyes, suffus'd with a sanguineous colour. The membrana tympani of one ear, with the annex'd little bones, was tinctur'd with blood; the tympanum of the other ear was more slightly ting'd indeed, yet shew'd a greater redness than usual.

9. The disorder in the lungs, which was the most considerable, ought not, doubtless, to be accounted for from the recent punishment, but from some other cause of a more ancient date; and seems to be that which had render'd the man liable to a difficulty of respiration, and a troublesome cough, especially when the blood, being excited by walking, came to the part where its passage was obstructed in that viscus, through which it must pass at that time in greater quantity, and with greater velocity: and at the same time, the blood might easily press out, from that vitiated part whereon its impetus was made, something into the air-passages, which, by its irritation, would give rise to a cough.

But though I would not deny, that the blackish kind of spots, with which the lungs were distinguish'd, might, possibly, with justice, be refer'd to suffocation; yet I do not, on the other hand, affirm it for certain; and in this, and the preceding observations, I do not by any means find the same appearances, which were found by Bartholin in two persons who died of the same kind of death, as you will read in this second section of the Sepulchretum (*d*). For he saw, in one of these subjects, the lungs "not only very large, variegated, and blue, with a redness interspers'd like marble," to which we might resemble those spots, but also "so full of a frothy blood, that not only the external veins were tumid on every part of the enveloping membrane, but were an obstruction to him in demonstrating the dissection of the heart: and in the other, "the air pipe of the lungs fill'd with a copious froth." Littre, also, in a woman (*e*), whom two men had suffocated, by squeezing her neck with their hands, found the lungs extremely tense, from the included air, and their external membrane universally distinguish'd by a dilatation, and swelling, of the sanguiferous vessels. Pacchioni (*f*) also, "in those who die by the halter," mentions, that the lungs "were suffus'd with black blood and mucus." And in regard to froth, or foam, it is sufficient to turn to the aphorism of Hippocrates (*g*), especially as it is translated into Latin by Celsus (*h*), in the last and eighth chapter of the second book. The words are, "Nor does that person ever return to life, who is taken from the gibbet with a foam at his mouth:"

(*d*) Obs. 23, & 24.

(*e*) Hist. de l'Acad. R. des Sc. A. 1704.
Obs. Anat. 2.

(*f*) Oper. Edit. 4. in Prolapf. Cord. hist. 1.

(*g*) 43. Sect. 2.

(*h*) De Medic.

although I shall make some remarks upon this aphorism below (*i*), and you will also see other things remark'd, in like manner, by the celebrated Langguthus (*k*); in whose dissertation you will find, among other things, which he saw in the dissection of persons who had been hang'd *l*), that the lungs were turgid with a great quantity of blood. Why did not Valsalva, then, observe such things? Was it because he came so late to the examination of the lungs, as the order of public demonstration requires? The observation of Harvey (*m*), which, as well as the others that are near it, and belong to the foregoing section, are, to my great surprize, omitted in the *Sepulchretum*, may illustrate this subject in some measure. His words are, "I have sometimes, in a human body recently strangl'd, that is, within two hours after hanging, when the chest and pericardium were open'd, before the redness of the face was gone off, demonstrated to many witnesses, that the right auricle of the heart, and the lungs, were very much distended, and stuff'd up with blood, but chiefly the auricle, to the bigness of a large man's fist, and so very turgid, that you would suppose it was ready to burst. Yet all this quantity of blood on the following day, when the body was quite cool had entirely disappear'd, having flow'd down into other passages." That is to say, the blood being fluid, as I have already said it has been observ'd to be in bodies of this kind, easily slides down to the parts of the vessels that are, from their situation, inferior: and, indeed, it is driven thither by the fibres being every-where cool'd, and for that reason contracted; so that the anterior vessels of the lungs cannot be equally tumid with the posterior vessels, in bodies which are plac'd in a supine posture. And the foam, by the escape of the air-bubbles, will subside into a very small quantity of moisture, and, on the body being mov'd, easily flow out.

10. But what shall we say is the reason, why Valsalva remark'd, that the blood was fluid, as I have related, and made this observation also expressly, besides, that there were no polypous concretions in the heart, nor any grumous blood found there, when in that very section of the *Sepulchretum* (*n*), it is copied from Besslerus, that in a virgin, "who died of suffocation, the body of the heart was fill'd with a grumous blood, which was common in suffocated persons?" Without doubt, I shall say, that in this part of the epistle of Besslerus, which, in the book of Zacutus, quoted in the same place, makes the sixty-fourth, and not the sixty-third observation; as the question is of a virgin, who, after an illness of six years continuance, was at length carried off by the last of all diseases, suffocation; so it is very probable that Besslerus intended rather to speak of this kind of suffocated persons, than those, who, being in good health, were suddenly strangl'd by external force, of which kind these in general are, that are propos'd by Valsalva. For it is manifest, that the disposition, or constitution of the viscera, and of the blood also, is quite different in the one and the other, no less than that thick and grumous blood, as it is the more unfit to be carried through the small vessels of the lungs, is so much the more apt to stagnate therein, and bring

(*i*) N. 36.(*k*) *Disp. de redd. rec. præfocatis adempta anima* § 11.(*l*) *Ibid.* § 10.(*m*) *De Circul. Sang. Exerc.* 3.(*n*) *Obs.* 32.

on suffocation. And I do not doubt, but even they who are suffocated with a halter, if they happen to have blood very prone to concretion, will not only have grumous, but even polypous concretions also, in the reservoirs of blood; such as, to omit others, I find were drawn out by Coiterus (*o*), "in the bodies of persons who had been hang'd," from the sinusses of the dura mater.

11. Moreover, the same fluidity of the blood, which was in those who, when in perfect health, were strangl'd, lessens my surprize, that Valsalva found the brain, in the same persons, nothing alter'd from its natural state, or at least the vessels of the dura mater only, something turgid with blood; whereas, in the mean while, the internal vessels of the skin, that covers the cranium, and those which lie about the eyes, or are dispos'd through their retiform coat, or through the tympanum of the ears, were so turgid, that some of these parts appear'd to be inflam'd, and others, as the membrana tympani, and the annex'd little bones, seem'd to be even dy'd with blood. For the halter being loos'd, and those very large passages of the internal jugular veins, being set at liberty, for the return of the blood, the much greater part of this blood, inasmuch as it was fluid, easily flow'd out of the sinusses, and the great veins that open into them; whereas that, which, by reason of the windings, and narrow passages of the more distant and smaller veins, had a less speedy return, stagnated therein, some of them only excepted, which, in consequence either of being more full, or having less resistance, had been previously broken through by the halter, or other external violence; for Littre, in that woman spoken of above (*p*), found the membrana tympani, on one side, not only bloody, as Valsalva did, but ruptur'd, so as to have emitted about half an ounce of blood; although in proportion to the various degree of strangulation, the violence of the cause of rupture in the vessels, may be greater or less, as I shall shew below (*q*); not to mention the different laxity in different persons, both of the small veins and membranes of those parts, and their different dispositions, from whence it seems to have happen'd at other times, that the famous anatomist, Philip Conrade Fabricius (*r*), "in persons who had been strangl'd with a halter, sometimes," but not always, "found the anterior lamella" of the tunica cornea of the eye "receding from the internal, or posterior part;" and from hence that the excellent Peter Christopher Burgmann (*s*) saw the coats of the eyes forming themselves into two little horns, almost like fingers, and coming down by degrees, to the very cheeks of one, out of three, who were hang'd upon a gibbet, which is, indeed, a very rare instance; yet you will not say that it is "without example," as Garmannus (*t*) could, perhaps, formerly say, when he produc'd an instance, not unlike this, from Kornmannus, making use of his own words: "a certain chymist being hang'd upon the gallows, had two horns sprouting from his eyes, of the length and bigness of a finger:" and these words I have copy'd, that you may not ask with Burgmann, but may know, that they are no other than what Bertramus had before us'd, in the writings of Bartholin (*u*).

(*r*) Obs. anat. (*p*) n. 9. (*q*) n. 38. (*t*) l. 1. cit. supra, ad n. 6. tit. 10. § 10.

(*s*) Ideo anaton. Pract. sect. 4. & 11.

(*u*) Differt. epistol. de singulari tunica utriusq. oculi expans.

(*u*) Cent. 2. epist. med. 11.

12. Finally, this difference, in the neck, is to be accounted for, equally, from the different mode of strangulation, and from the different constitution of the persons strangl'd; I mean, that in some, this or that muscle is broken through, and in others also, some cartilages of the larynx, in others the upper vertebrae are luxated, or rather broken, and in some, nothing of this kind is found. Valsalva has mention'd the muscles being broken through, in the last history (x). And in that, which will be immediately subjoin'd, he has mention'd a cartilage of the larynx being broken, together with these muscles.

13. A hang'd man had the sternothyroidæi, and hyothyroidæi muscles torn, so that only a membranous substance remain'd in their place, about the annular cartilage. And this very cartilage was also broken asunder. In the left cavity of the thorax, the pleura was, here and there, unequal, with many, and hard, tubercles; some of which were equal in size to a lentil, some to a vetch, and others to a bean.

14. These tubercles were owing to a disease, which was easily contracted by the noisomeness of a dungeon. For I have made a remark, relative to this very man, whose body I dissected, together with Valsalva, in the college at Bologna, in the year 1703, that he was almost a year in prison, and that, besides these tubercles, almost of a cartilaginous hardness, which beset, nearly, the whole pleura, on that side; he had the left lobe of the lungs also, in some places, pretty hard, and in the same cavity of the thorax, a small quantity of reddish humour. And from what cause it happens, that scarcely any of those who are long detain'd in a prison, ever come out healthy from thence, the Sepulchretum itself (y) takes notice, that is to say, from the constant bad air, and often, even the provision, continual grief, and an inactive life, which although it renders some of them fat, yet I cannot approve of the use of such fat, but of that which is prepar'd from a man, who is accidentally kill'd, when in good health.

But to return to what relates to the violent lesion of the parts, which are in the neck; that was the greatest, as far as relates to the cartilages, which the celebrated professor Weisius (z), found in a soldier, who had been hang'd. For the annular cartilage "was broken asunder, into many pieces, and the "inferior part of the trachea entirely torn away from the larynx;" so that blood, and this in a considerable quantity too, flow'd out both by the nostrils and the mouth, and descended into the bronchia. And that the cartilages are not only broken sometimes, but sometimes also, even some of the vertebrae, Columbus (a) may seem to have hinted, when he denies that the head is luxated in hang'd persons, according to the observations he had made "frequently, at Padua, at Pisa, and at Rome;" and he even affirms, that so great is the strength of this ligament, to prevent luxation, "that the second vertebra may be more easily broken, than luxated; and not the second only, but the first also." If we acknowledge that this may be so, we shall then confess that the Latins spoke properly, when they call'd this kind of punishment, which we now speak of, *cervicis frangere*, or, to break the

(x) n. 8.

(y) J. hoc. 2. S. 7. in adnot. ad obs. 12.

(z) Commerc. Litter. A. 1745. Hebd. 24.

I. sub n. 7.

(a) De re anat. l. 3. c. 2.

neck, as you have it in Cicero (*b*). But if we do not allow of it, we shall then suppose, that they spoke with greater justness, and propriety, when they said, *laqueo gulam frangere*, or, to break the gullet with a halter, as you find it literally express'd in Sallust (*c*), so we do but take it for granted, that they meant the throat, when they spoke of the gullet. For that the larynx is sometimes broken, from that cause, I have seen, together with Valsalva; but have never seen the vertebræ broken, nor yet even luxated. But when I say this, I do not say it by way of pronouncing any thing, in regard to the diffension, which I observe amongst very experienc'd men. For some, as you will even read in the writings of Palsin (*d*), say, that they had found, in almost all the persons, who had been executed in this manner, that the first vertebra of the neck was entirely separated from the second. On the contrary, others deny what Columbus had denied of these vertebræ, and not only of these, but even of all the remaining, vertebræ. Yet am I not ignorant, that it is written by Panarolus, for example's sake; for I will use the observation which you have in the Sepulchretum (*e*); that he, by dissection, had found the second vertebra of the neck luxated. But, at the same time, I am not ignorant, that he found this in the dissection of a person who had fall'n from a tree, so that the vertebra might have been luxated, and broken, at the same time (*f*). For these reasons, then, 'till I have an opportunity of again enquiring more diligently into these things, I shall be not a little chagrined, that it did not come into my mind to do it formerly, when I had opportunities at Bologna; which I neglected to do, partly because there was less dispute, at that time, about these things, and also, because bodies of this kind are generally those of men in good health (criminals being there detain'd but a little time in prison) and thereby give so great an opportunity of enquiring what is natural, which took up so much of my time, that scarcely any remain'd, even for a slight enquiry, into the peculiar effects of strangulation. Wherefore, of what I then noted down in papers, nothing relates to the present question, except some few things, which I shall immediately subjoin.

15. A young man of four and twenty years of age, having been publicly hang'd, his body was given to the anatomical theatre at Bologna, for public demonstration, in the year 1705. The scrotum seem'd to be bruised, as it were, and was of a reddish colour. The larynx was quite whole; nor were the muscles about it broken through, but even little, or not all injur'd: nor was there any thing else to be met with, in the dissection of the neck, which seem'd preternatural. The smallest blood-vessels appear'd in great quantity, and with great elegance, especially in the head; as if they had been fill'd by injection. Yet I, nevertheless, found no injury within the cranium: nor did I wonder that the sinusses of the dura mater were empty, as I had observ'd, that a great quantity of blood had before flow'd out from the jugular veins, which had been cut off with the head.

16. Is the larynx of young persons, by giving way to the halter, less liable to rupture? Valsalva, as you have seen, has, certainly, not mention'd its

(*b*) In Verrem. l. 5. & in Vatin.

(*c*) De Conjur. Catil.

(*d*) Anat. du corp. hum. tr. 5. ch. 8.

(*e*) l. 4. S. 6. obs. 1.

(*f*) Vid. etiam epist. 56. n. 35. & 37.

being broken in young persons, nor do I remember to have seen it (g). The appearance of a bruise, and extravasation in the scrotum, was owing to the quantity of blood, flowing down from the suspended body, into the vessels, that were the least compress'd. Thus out of the two, I shall speak of next, you will see, that not only the scrotum of one was affected, in the same manner, but the penis was moreover tense also.

17. Two thieves, a middle-ag'd man, and a young man, were executed in the same manner, in the year 1706. The body of each of them, being taken down from the gallows, sooner than usual, that is, within four hours after being dead, and being brought to a place convenient for dissection immediately, was still warm on the external parts, though the season was extremely cold. When the body of the first was open'd, and the trunk of the great artery cut into longitudinally, under the emulgentis; it was observ'd, that fluid blood flow'd out both from the upper, and lower, part of the trunk, and that not in small quantity: and the concomitant trunk of the vena cava was extremely distended with blood. Before we saw these things, it had been observ'd, that the intestine ileum was, for some considerable tract, of a kind of livid redness, and that, in this place, it contain'd round worms.

18. I was not willing to pass by this last circumstance, because even in suffocated dogs, I have also observ'd, that the intestines were affected with a kind of inflammation, in that place where the worms form'd a nidus for themselves; so that the phlogistic colour, join'd with some protuberance of the intestines, pointed out to me their situation. But this man had certainly complain'd of no inconvenience of his intestines; so that some motion, or agitation of the worms, which had follow'd his death, seems to have excited the course of the blood, which was fluid, that way. From whence it follows, that when, in the opening of bodies, we see any part of the intestines ting'd with a colour of that kind, we must not immediately have recourse to inflammation, or gangrene, and pronounce that it had been affected with these disorders, in the living body: except either the symptoms which had preceded death, or the appearances that accompany this colour, in the dead body, jointly demonstrate it to us; since this colour may be brought on, even after death sometimes, especially when the blood is dissolv'd, and fluid.

19. But the carcase of the young man, besides the scrotum being affected with a kind of ecchymosis, as it were, had also the penis still tense. Being dissected about six hours after death, it was quite warm internally; and even seven hours after, still retain'd some warmth externally. The blood was fluid. The remaining circumstances, which I have minutely down, in relation to this body, and that above spoken of, do not all relate to the present question, and some of them are taken notice of in other places; as, for instance, that the arch of the colon, which generally lies under the stomach, and which was itself also, in this young man, plac'd much lower than usual, was situated below the navel; but above all, what relates to the lacteal vessels being full of chyle, almost half-concreted, and for that reason stagnating more, and distinguish'd with frequent valves, in the appearance of little knots: for you

(g) Sed vid. epist. 56. n. 37.

have the other circumstances describ'd in the fiftieth animadversion of the second of the *Adversaria*, from this very young man.

20. You know very well, how Ruyſch (*b*) explains the erection of the penis in dead bodies, when, in the summer-time, they are dispos'd to putrefaction. But the carcase of this young man was, at that time, very far from putrefaction, nor were the other parts of it inflated; and the season, as I have already said, was extremely cold. Paulus Zacchias (*c*), observing in his writings, that the same thing had been found in other hang'd persons as in this young man, assigns a reason for it, which is very suitable to the time wherein he wrote. But Lancisi (*k*), being about to assign the cause of the same circumstance, in him whom a convulsion of the whole body had carried off, after a previous suffocative asthma, affirms at the same time (*l*), "that a continu'd erection of the penis, after death, was generally met with in "strangled men," and says, that it arises from the fibres being convuls'd, and intercepting the return of the blood through the veins of the part. And if you should be willing to follow this opinion, inasmuch as you readily allow of convulsions in strangl'd persons, even from that distortion of the mouth, which I observ'd above (*m*), together with Valsalva; add also, that a quantity of blood easily flow'd downwards, in the suspended state of body, and that in so much the greater proportion, as, in the last pulsations of the heart, so much a greater quantity is dispatch'd into the lower arteries, since, by reason of the constriction from the halter, the less can be sent upwards to the superior. From which cause, that was easily to be accounted for also, which Columbus (*n*), in a woman who had been hang'd, accounted for from the menstrua being at hand, to wit, that the veins going to the vagina were "very large and very black;" and from this cause also, what I have seen in a man, who had hang'd himself in prison. For as the whole body was suffus'd with a livid redness, the internal surface of the urethra was much more so, and far beyond its usual appearance: but I scarcely examin'd any other part in that foetid body, being taken up with the public demonstrations of the year 1718, and much indispos'd in my health. Yet I extremely well remember, that from the very same cause, Valsalva did, in like manner, deduce this circumstance, that when both the carotid arteries were tied up in living dogs, there was a tension in the penis.

And I am glad that I happen to remember this narration of Valsalva's, since I find it is accidentally omitted in the papers, where he minuted down the other circumstances, that took place upon the constriction of the arteries in the neck. But it seems to me, that I have, at present, so convenient an occasion of communicating the experiments of Valsalva, relative to this subject, which, in the *Epistolæ Anatomicæ* (*o*), I promis'd to set forth at some other time, with precision and order, nor omit the experiment of Galen relating to the same question, that unless I make use of it, I fear I shall scarcely find an equal opportunity of discharging my promise. For they so far relate to the subject in hand, that they help us to form a judgment in regard to

(*b*) Theſ. Anat. 10. n. 95.

(*c*) Quæſt. Med. Legal. l. 5. tit. 2. qu. 11.

n. 5.

(*k*) De Subit. Mort. Obſ. har. 4.

(*l*) Ibid. in Schol. n. 8.

(*m*) N. 3.

(*n*) De Re Anat. l. 6.

(*o*) XIII. n. 30.

those causes that are generally assign'd for the death of such as are publicly hang'd. But as these experiments have succeeded differently with different men, even from the most ancient times, we must begin very far back, and from the desire we have of finding out the truth, we must well consider, and compare one with another, the ancient and modern experiments.

21. The first of all who mention'd the experiment of tying up both the carotid arteries, seems to many to have been Aristotle, that is to say, to Columbus (*p*), to Salius (*q*), to Sanctorius (*r*), and to others. But to me, if I am allow'd to dissent, with submission, from such very learn'd men, Aristotle does not seem to have mention'd the experiment of tying up the carotid arteries, but quite another thing, that is, the experiment of tying up both the internal jugular veins. Nor is my opinion shaken by that passage (*s*), which alone I see is pointed out by them, and by Cæsalpinus (*t*), where Aristotle coming more closely to the point, says, that "they who have the veins in " their neck constricted, become insensible:" nor does it escape me, that the ancients, by the term veins, did frequently also intend the arteries. But I pay regard to that other passage (*u*), where, after he has distinguish'd the greater vein, or the cava, from the aorta, and undertaken the description of the superior cava, and come on to the jugulars, these, says he, "when they " enter the neck, dividing into two branches, go towards the artery of the " lungs; and these veins being at any time constricted from without, the " persons fall down bereav'd of their senses having their eye-lids clos'd; " and being thus stretch'd out, and embracing the artery, they are continu'd " to that space, on the side of the ears, where the jaw-bones are join'd with " the fauces." I do not here, with Riolanus (*x*), who otherwise understands the jugular veins with me, confirm my opinion from this circumstance, that they are said to receive betwixt them, or embrace, the artery; for it is not the carotid artery, and much less, as Niphus (*y*) explains it, the aorta, but "the artery of the lungs," as Aristotle just now call'd it, that is the *aspera arteria*, near to which they are said to ascend in the lower part of the neck, and bending themselves, moreover, this way and that, are said to receive it between themselves. For that the jugular veins, and not the carotid arteries, are here describ'd, is manifest, not only from the description of the superior cava, that he had undertaken, as I before asserted, but also from this circumstance, that when he has finish'd that description, he immediately goes on to speak of the part of the aorta corresponding to it, in this manner (*z*): "The lesser vein also, which I have said is nam'd aorta, is dispers'd in the " same manner, in branches, and these follow the branches of the greater " vein." And that Aristotle spoke of the internal, not of the external jugulars, their ascent near to the *aspera arteria*, sufficiently proves; which I mention, lest you should, perhaps, imagine, that this expression, "being " constricted from without," relates to the external jugulars.

(*p*) De Re Anat. l. 14.

(*q*) De Aff. & Partic. c. 2.

(*r*) Commen. in Art. Med. Gal. qu. 35. &

in l. Fen. l. Avic. qu. 108.

(*s*) De Somno, & Vigil. c. 2.

(*t*) L. 2. Med. Quæst. 15.

(*u*) Hist. Animal. l. 3. c. 3.

(*x*) Anthropogr. l. 3. c. 9.

(*y*) Expos. in hunc loc.

(*z*) Initio c. 4.

22. But if you ask me, by what means this could be done, I shall give nearly the same answer that was formerly giv'n by Caspar Hoffmann (a): "Did Aristotle see any such thing, as Colæus, in the sixth book, and sixth chapter, of his *Disquisitiones Physiologicæ* relates," of circumforaneous mountebanks, who by means of a string being thrown round the vessels, and jugular veins of a she-goat, which they could relax, or tighten, privately, and according to their pleasure, so as now to force the animal to fall down, destitute of all sense and motion, and presently to suffer it to leap up again. And as Aristotle has spoken expressly of "men," the same Hoffman adds, in another place (b), that Benedic I. *Præf.* 34, writes, "that it is customary in Assyria to tie up the veins of the neck, in those young men, whose præputia they want to cut off. For by this means they lose all sense and motion." To this we will add the passage of Valverdu (c): The carotid arteries, says he, "being obstructed, or from any cause whatever shut up, we immediately grow stupid, and fall asleep. And this experiment I saw made by Columbus, at Pisa, in the year 1554, on a young man, in a large circle of gentlemen, not with less terror to them than laughter to us, who persuaded them that this was done by the force of incantation." It seems that there must have been an easy method of shutting up these vessels, which this young man would suffer by way of sport, and the by-standers thought to be an incantation. For which reason it were to be wish'd, that Valverdu, or Columbus, had explain'd it. But this the first did not do, as Riolanus observes (d), and Columbus still less, as when he had the fairest opportunity, in many places, to do it (e), he was not only silent upon the subject, but attributed the loss of the voice, in dogs, entirely to the nerves being tied up with the arteries, which frequently happens, and not to the arteries themselves being tied up. And if Hieronymus Rubeus (f) had read this passage, I do not doubt but he would have said, that he was at a loss what to think of the narration of Valverdu, in regard to which, he denied "it to be probable, that the very learn'd anatomist Columbus should have incautiously tied up the nerves together with the arteries:" although you will think, that Aristotle's book *De somno & vigilia* was not attentively read by Rubeus (g), whom the words of this author, pointed out by me in the first place (b), seem to have escap'd; words which are call'd by a certain person, as undoubtedly they are, "the very weighty and memorable authority of a philosopher," when he had read it by chance in Cæsalpinus; yet abus'd these very words, by contending, that what Steno had taught, "that a muscular fibre was actuated, and put in motion, by the blood," he had learn'd "from Hippocrates, and the rest of the ancients, and also from Cæsalpinus himself, in the third of the *Questiones Peripateticæ*, towards the latter part, where the argument from ligatures is expressly propos'd," and that passage of Aristotle, which we have spoken of, "is related." What? if he had read that other passage, in which the men are said "to fall down," or those things

(a) Comment. in c. 10. l. 8. Gal. de Us. Part.

(b) De Thorace, l. 2. c. 29.

(c) Anat. corp. hum. l. 6. c. 11.

(d) C. 9. cit. ad n. 21.

(e) L. ibid. cit. & l. 7.

(f) Annot. in Cels. l. 4. c. 1.

(g) Ibid. (b) N. 21.

which were said juſt now of other men, and of the ſhe-goats of mountebanks. But all theſe things, though they were evidently true, and were what Cæſalpinus touch'd upon, in that laſt queſtion of the fifth book, which ſhould have been added, did not, however, bring on this concluſion, that we ſhould ſuppoſe, when the arteries were tied up which went to the muſcles, that the motion of theſe muſcles was, in conſequence, immediately ſuſpended, eſpecially as Galen (*i*) ſays, “ That the obſtruction of an artery by a ligature, is the cauſe of no preſent injury to the part whereto it goes;” but only tended to prove this propoſition, that when the veſſels in the neck were conſtricted, the fluid did no longer flow into the brain and nerves, which was neceſſary to their functions. Nor would the paſſage of Hippocrates (*k*) convey any other ſignification; I mean, “ that the obſtructions of the veins “ cauſe any one to be ſeiz'd with a ſudden privation of voice;” if others like Hoffman (*l*), whom we have already commended, could ſuppoſe, that this interception of the veins of Hippocrates “ was the ſame with the interception of the veins, in the neck,” of Aristotle. But whereas Galen (*m*) ſays, that Hippocrates “ calls repletions, which ariſe from fulneſs, interceptions of the veins;” and Hippocrates himſelf, when he explains theſe interceptions, which “ happen to a healthy perſon, without any manifeſt “ cauſe,” mentions the heart, indeed, or the liver, but not a word of the brain; I, for theſe reaſons, dare not venture to ſay, that this experiment we ſpeak of was known to Hippocrates, as if he had alluded to it, and choſe rather to begin with Aristotle. And I hope you will not be diſpleas'd, that I ſhould prove the experiment mention'd by him, not to relate to the arteries, but to the veins of the neck. For you will ſee afterwards alſo, in regard to this experiment, of how much conſequence it has been to diſcourſe of it here.

23. As to that experiment, however, which relates to the arteries of the neck, it evidently appears from Ruſſus Ephēſius (*n*), that this was known alſo to the ancients, as he ſays, “ that the ancients had nam'd the arteries “ which go to the neck, the carotids, or ſomniferous arteries, becauſe when “ they were compr'eſs'd, they affected the man with ſleepineſs, and took away “ the voice.” He then ſubjoins this, which led Daniel Le Clerc, otherwiſe a very learn'd man, into an error: “ But in our age, it is found that this is “ an affection of the ſenſitive nerves, which lie near to the arteries, and not “ of the arteries themſelves.” Hence learn, ſays Le Clerc (*o*), “ that the “ nerves, which are ſince call'd recurrent nerves, were then lately found “ out;” and conſequently, ſays he, in another place (*p*), “ it is to be obſerv'd, “ that Galen attributes to himſelf the diſcovery of theſe nerves; although “ Ruſſus Ephēſius, who liv'd before his time, had already made mention of “ them.” For Le Clerc did not attend to this circumſtance, that as the trunks of the par vagum, from whence theſe little branches ariſe below, are nearer to thoſe arteries, than the recurrents, Ruſſus certainly meant to ſpeak

(i) De Puſ. Uſu, c. 2.

(k) De Viſ. rat. in Acut. n. 37.

(l) Comment in c. 12 l. 16. de Uſ. Part.

(m) Comment. 4. in cit. Hippocr. l. n. 23.

(n) De corp. hum. part. appell. l. 1, c. 34.

(o) Hiſt. de la Medec. 3. part. l. 2. ch. 3.

(p) L. 3. ch. 7.

of these trunks, which he certainly does not say were found out in his age; but he says it was found out in his age, that from the compression of these nerves (which may be easily tied up with the arteries) those affections were brought on, which had been before attributed to the compression of the arteries.

And to this question relate many passages in Galen, but especially these; which I am surpris'd that Le Clerc should have overlook'd. He says (*g*), "I was accusom'd to call those nerves, which I found out myself, the vocal nerves: for my preceptors knew only those which lie near the arteries.—" And the muscles of the throat are injur'd in the same manner, whether these recurrent nerves, or those which lie near the arteries, are hurt:" that is to say, as he said a little before, "either incis'd or compress'd with a halter." And in another place (*r*), in like manner, when he had mention'd "the nerves that are annex'd to, and associat'd with, the carotid arteries," and in consequence of experiments, he had admonish'd, "that the animal was immediately render'd mute," from the constriction of those nerves, and not from the constriction of the arteries, he at length says these things: "But the greater part both of physicians and philosophers tied up the nerves also, in their ligatures, together with the arteries; and as they saw that the animal immediately lost its voice from thence, they suppos'd that this injury was to be ascrib'd to the arteries; and call'd it sleep, though not with propriety, unless they would have silence be call'd sleep;" for besides the vocal faculty, as he had said above, "no other function contracts any injury, neither at that instant, nor after some little time, not even if the nerves annex'd to the arteries are cut through."

But you, in the mean while, plainly see, in what circumstance he differs from Ruffus, and from those physicians and philosophers who liv'd in his age. You see, in like manner, how far he agrees, or disagrees, with those who have repeated the experiment afterwards, the observations of whom, and especially those of Valsalva, need not to be repeated here; as I have related them at large in a former work (*s*), either as far as relates to the nerves, which lie near to the carotids, being tied up without the arteries, or cut asunder; or as far as relates to the same nerves, being tied up, together with these arteries (*t*). Nor should we wonder greatly, because, since those observations were publish'd, it happen'd to the celebrated Abraham Ensius (*u*), that in a very young whelp he saw, upon the tying of these nerves, "all sense lost in a moment;" since it has happen'd to others sometimes, whatever might be the cause of it, that the experiment had the same consequences, and even as I have related in that anatomical epistle (*x*), that death has immediately taken place thereupon: but that which much more frequently happens, and indeed that which almost always is observ'd, it becomes us particularly to take notice of. And indeed, when Joseph Henry Brunnerus (*y*), who was worthy of his illustrious grandfather, repeated these experiments

(*g*) De loc. aff. l. 1. c. 6.

(*r*) De Hippocr. & Plat. Decr. l. 2. c. 6.

(*s*) Epist. Anat. 13. n. 27. & seq. u/q. ad 40.

(*t*) Ibid. n. 30. & 31.

(*u*) Diff. de Causa vices cord. altera produc.

n. 4.

(*x*) n. 30.

(*y*) Exper. circa ligat. nervor. § 25. & seq.

not long ago on a dog, and on rabbits, he never observ'd any thing of that kind, but rather the contrary; which I would have you compare with the observations of the greater part of those who have made the experiments, and in particular with the observations of Valsalva, and with the remarks I have made upon them, either when I have admonish'd, that the ligatures with which the nerves are constricted do not all produce the same effect, or when I have observ'd that the animal which had these nerves cut asunder, had liv'd longer than that whose nerves were tied. I also had demonstrated this, that they were every now and then deceiv'd, who suppose the par vagum, in brute animals, to descend through the neck, disjoin'd from the intercostals, as in men, so that the one may be tied up, or cut asunder, without the other: and if I may be allow'd to speak the truth, the greater part of those who have since that, either explain'd, or taken notice of experiments, and disquisitions of this kind, do not seem to have been very mindful of this admonition.

But let us dismiss these things. For it is enough at present, if, not unmindful of my design, I consider the experiments of Galen, and others, which relate to the languiferous vessels in the neck being tied up, without the nerves. And I mention Galen, as usual, because if any persons before him did tie up the vessels without any nerves, though the error may be now discover'd, these observations have not reach'd me.

24. Galen then, after having written what we just now related, in regard to the nerves, has in like manner told us, at the same time (z), what he had observ'd, when the arteries were tied up separately, or the veins which run betwixt the heart and the brain; that is to say, the carotids, and internal jugulars. And when the arteries were tied, "that the animal neither became " mute, nor sleepy, which most of those since Hippocrates, who were but " little skill'd in dissection, have testified:" but when the veins were tied up, "that no function was, to appearance, lost:" and he concludes in such a manner, as to say, "that the animal was not lull'd to sleep, when the nerves " were even cut, and still less when the arteries were;" (the flux of blood, however, being entirely prevented) "but if the nerves are injur'd, that he " then is dumb; if the arteries are hurt, that this by no means happens; " and if the veins, still less."

Moreover, he affirms, in another place (a), "that he had often made the " experiment" of tying up the carotid arteries, "and that the animal had " suffer'd nothing from it, neither immediately, nor afterwards, and that he " had even watch'd the creature the whole day; and at the middle of the " night, had at length kill'd it; as he judg'd, that so long an experiment " was no more to be depended upon: for that in so great a space of time, in " which the cords were ty'd round the arteries, some of the principal parts " might be injur'd by consent.

Finally, in another place (b), after asserting, "that in this manner, the " animal continu'd a whole day without injury," as he had often experienc'd, he added this one observation, that having compell'd him to run, "he had " seen him run very well for some time, but after that very languidly, and " at length not able to run at all:" moreover, having again forc'd him,

(z) c. 6. l. 2. *supra*, ad n. 23. cit.

(b) De Puls. Usa. c. 2.

(a) De utilit. Resp. c. 5.

“ that he did not continue his race so long as before, but was instantly disabled.” And this is the sum of those things, which Galen says he had observ’d on the tying up of the carotid arteries, as they appear’d to me, upon turning to those three passages, that I have pointed out in the bottom of the pages; for as to the book, that is the eighth, *De Administrations*, which I see is refer’d to upon this question, by learned men, I could never yet find any thing in it, that relates thereto.

Galen had many who agreed with him, and among these, of those who repeated the experiments, Columbus, as may be gather’d from what has been said above (*c*), and Sanctorius (*d*), who says, “ I saw a dog which had his carotid arteries tied, able to move himself, and preserve his senses, for the space of an hour: yet after many hours, it is not to be doubted, but by reason of the wonderful consent betwixt the heart and the brain, he must at length die:” and lest you should certainly believe, that after the space of an hour, the dog had entirely lost all sense and motion; you will perhaps see the reason, why he wrote thus, from another passage of the same Sanctorius (*e*), where he says, “ I saw a dog whose carotid arteries were tied, and after that cut entirely asunder: for some space of-time he could still move, and then, by reason of the great loss of arterial blood, he died:” and if you believe this to be the same dog, you plainly see why he did no longer retain his sense and motion: but if you suppose it to be another, you then perceive that the experiment answer’d twice, according to Galen. And amongst those who have written in our age, the excellent Archiater Van Swieten (*f*) says, “ I tied up both the carotid arteries of a dog, nor could I observe, that he suffer’d any injury from thence: for I found this animal, eight days after, brisk and sprightly.” And the celebrated Emetus (*g*) writes, that a dog, on whom he had perform’d a like operation, and had even tied up the jugular veins, at the same time, which Van Swieten had not done in his dog, except he did it after those eight days, had also enjoy’d “ the most perfect health and vivacity for some weeks.” Yet he adds (*h*), that on repeating the experiment often, though none of them was seiz’d with an apoplexy, nor any of the dogs died, it happen’d, “ sometimes, that for the space of two hours, the animals seem’d sleepy.” But you will see in Dionis (*i*) that the dog in whom he tied up both the carotids, was sleepy for a much longer space, even for some days after the constriction; notwithstanding that, after these days, he recover’d his former vigour, and his alacrity to action. And you may also join the observations of these persons with those of Galen, if you except, in some measure, the two last.

But on the other hand, the greater part have by no means follow’d Galen, as Avicenna, for instance, who, as you have it in Salius (*k*), says, that “ the apoplectic veins” (for thus the Arabians call’d the carotids) “ being tied up, sense and motion is instantly lost:” and with him Carolus Stephanus seems to have agreed in opinion (*l*); and, among the more modern, Baglivi,

(*c*) n. 22.

(*d*) quæst. 35. cit. supra, ad n. 21.

(*e*) qu. 103. ibid. cit.

(*f*) Comm. in Boerh. Aphor. § 170. n. 3.

(*g*) Tentam. de Morb. Cap. n. 30.

(*h*) not. a ad n. 33.

(*i*) L’Anat. de l’Homme Ed. 5. Demonstr. 7.

(*k*) De Affect. Partic. c. 2.

(*l*) De dissect. part. corp. hum. l. 1. c. 88.

in that passage, which I have quoted in a former work (*m*). And among those who have made the experiment, I see that Drelincurt is commended (*n*), whose experiment, though only single, and continu'd but for a little time, nevertheless sufficiently contradicts that of Galen. It runs thus: "The carotid arteries being tied, but not yet quite obstructed, and the head of the mastiff hanging over the edge of the table, he was oppress'd with a lethargy; but when his head was rais'd, and the left carotid open'd, he was rous'd, and shook himself." Nor must it be entirely pass'd over in silence, that the very experienc'd man L'Amur (*o*), although he was not in particular upon this enquiry, and saw it only for a very short time; having tied up the trunks of the same arteries, in a strong dog, the animal immediately fell into a sleep.

25. Amongst experiments that differ so much from each other, take what Valsalva, who made it his business to consider this one thing only, and to ascertain the event, did not make once, but three times; nor for a short space of time only, but for a much longer than any other person, as far as I know, had done, making observations not only in living dogs, but, after that, in dead animals also, which I have never read of being done by any one who had undertaken this experiment alone: for Drelincurt (*p*) had made the experiment so many times together, on the same mastiff, that the few things he describ'd from the dead animal, seem to belong more to another place than to this.

Valsalva, therefore, having tied up both the carotid arteries of a dog, in the lower part of the neck; he receiv'd no detriment as to the motion of his limbs, yet his head remain'd hanging down, and seem'd to be, in a manner, dull and stupid. But on the following night, a great quantity of saliva being discharg'd from his mouth, in the morning that dullness and stupidity were shaken off, and the dog seem'd to have a cheerful aspect, and ate with greediness what was offer'd him, notwithstanding he had some difficulty in swallowing. In this manner he liv'd tolerably well, for five days, moving all the parts of his body with ease, and according to his occasions, and walking up and down the house. In the mean while, however, the lips and the head, and the interior parts of the neck, began to swell: and notwithstanding he still discharg'd a great quantity of serum from his mouth, yet the tumour still more and more encreasing continually, and his strength by degrees failing him, he died on the sixth day.

In dissecting the neck, it appear'd that some of the lacerated parts had begun to be attack'd with a gangrene: and that there was not the least passage, for any thing to flow, through the constricted arteries. The internal jugular veins contain'd a little grumous blood only, whereas the other veins, whatever they were, that go through the head, on the outside of the cranium, were tumid with a large quantity of blood. But there was a little only in the vessels of the brain, which, in other respects, had a very natural appearance. In the right ventricle of the heart, was the beginning of a polypous concretion. Finally, the tumour that occupi'd all the external parts of the neck,

(*m*) *Epist. anat.* 13. n. 30.

(*n*) *Experim. anat. canicid.* 1. n. 10.

(*o*) *Mem. de l'Acad. R. des Sc. A.* 1749.
Exp. 2. (*p*) *loco modo cit.*

and head, was made up of stagnant serum, which, in its colour, and consistence, resembl'd a jelly.

Valsalva having, by letters, inform'd Malpighi of these things, which he had lately observ'd; Malpighi return'd thanks, by letter, a little after he came to Rome: this letter bore date the twelfth of December, in the year 1691, and he, at the same time, exhorted him to repeat the experiment again, and not once only, but frequently, that he might see, whether that kind of jelly always occur'd, and the other things answer'd in the same manner.

26. He therefore tied up the same arteries in another dog: and saw the same drooping posture of the head, on the first days: his neck also was something swell'd; he had the same greediness in taking his food; and the same difficulty in swallowing: besides these things, he observ'd a manifest weakness of his muscles. But it often happen'd that blood flow'd from the wound: and when this did happen, the dog, on that day, entirely loath'd food, which on the day after, when the blood was at rest, being grown more brisk, he very eagerly desir'd. Many days being pass'd in this manner, and the blood having entirely ceas'd flowing, the dog was nearly as well as he had been before the arteries were tied; but on the twenty-third day from the operation, he was kill'd, and dissected, by Valsalva.

One of the carotids, below the ligature, having suffer'd a slight laceration, had pour'd out the blood frequently that way, till a few days before death, it was sufficiently agglutinated. But where the arteries had been compress'd by the ligature, the parietes were connected together, in both of them, and they were harden'd into a ligament, in the same manner with the umbilical vessels, so as to transmit not the least moisture, nor the least air (what Van Swieten (q), and what Emettus (r) found, you will see in their writings). And yet none of the arteries, and in particular the vertebral, were become in the least wider than usual. In the brain was nothing worthy of remark, except that about the beginning of the spinal marrow, a humour was found, which was equal, in its weight, to about the third part of an ounce, and seem'd, in its nature, very much like that humour which is found in the cavity of the joints.

27. In a little bitch also, whose carotid arteries were tied up, he observ'd these things. She was much more brisk than the former dogs; but liv'd no longer than three days, having an utter aversion to food, and being excited by a kind of madness, as it were, to bark at every body. Being dissected, nothing occur'd that was worthy of observation: although the carotids, in this animal, were likewise found to be closely tied up.

28. It is of no small importance in respect to Galen, that of the three dogs, on which Valsalva repeated his experiment, not so much as one of them was seiz'd with a sleepiness, nor lost the faculty of the voice. For as to his not mentioning barking in the two first, I would not have you for this reason suppose, that they did not bark; since you see, that he would not have mention'd it in this little bitch, unless to signify her being stirr'd up with a kind of madness; and that in the two former he had even taken notice of a little difficulty of deglutition, which, as far as I know, had not been observ'd by

any other: an evident proof, that he would not have pass'd over, by any means, so considerable an effect as the diminution of the voice, which is easy to be observ'd, by every body, in a dog, not to mention the total abolition of it.

Of those things, however, which he observ'd, some seem to belong chiefly to the peculiar dispositions of the several dogs; as, for instance, that the bitch refus'd food, and was in some measure mad; or that the first dog, besides the great quantity of fluid discharg'd from his mouth, had his head and neck so much swell'd with stagnant serum; unless you will, perhaps, say, that before this could have happen'd, the bitch was dead; and in the other dog, that the redundancy of serum had flow'd out of the wound at the several times that the wound bled; so that the tumour, which began also to rise in this dog, of course did not increase, but rather decrease. And, indeed, either something of that kind, or some different disposition in the different vessels, seems to have been the cause, that all of them were not affected with the same tumour, if the true cause of it be such as was imagin'd by Valsalva in the former dog (*s*). For he suppos'd, that the impulse of the blood through the arteries being taken away, that which was brought by the corresponding veins had stagnated in them, from whence so great a turgescency of those vessels, and, consequently, the separation of serum, and stagnation, especially as the strength of the fibres, by reason of the influx of blood being deficient, was weaken'd, and the blood could not be sufficiently propell'd. But if you object to this theory, that there was no serum effus'd in the brain, and that neither the veins thereof, nor the sinusses, nor the internal jugular veins, had swell'd with the stagnating blood, all which vessels correspond to the carotid arteries; only call to mind the vertebral arteries; for although Valsalva did not perceive them to be at all widen'd (*t*), yet it cannot be denied, that they must have receiv'd so much the more blood, in proportion as the carotids admitted less, and carried it to the brain, and into the branches of the carotid arteries; and not only into the two posterior branches, which are found to be larger in beasts than in men, but also into many other lesser ones, that are nearest to its small branches, and communicate with them, and by this means, in some measure, have kept up the proper circulation in the brain, and consequently have help'd forwards the return of the blood from thence by the veins.

29. And this is the very reason, though differently explain'd by different persons, why Andreas Vesalius (*u*) formerly, and Christopher a Vega (*x*), and not only the more modern observers, did not think, that the experiment of Galen was to be denied, but the consequence which he deduc'd therefrom. And if you enquire of the same more modern gentlemen, why Drelincurt (*y*), when he repeated the same experiment, saw an apoplexy follow it, or at least a lethargy? perhaps they can no otherwise account for this difference, than by supposing a different disposition of the arteries in the different dogs.

But if you ask, from what cause, then, a speedy death is the consequence

(*s*) Vid. enim infra, n. 32.

(*t*) n. 26.

(*u*) De corp. hum. fabr. l. 7. c. 19.

(*x*) Vid. apud Casp. Hofman Comment. in c. 10. cit. supra, ad n. 22.

(*y*) Vid. supra, n. 24.

of strangulation? They say, that it is the consequence of a constriction on the jugular veins, inasmuch as they do not return the blood that is carried into the brain by the vertebral arteries, which cannot be constring'd by the halter. And lest you should, perhaps, reply, that the vertebral veins can not be constring'd by the halter, and that for this reason the blood may be brought back by them; they observe in another place, that some blood also is carried to the brain at that time by the carotid arteries; for that these are sufficiently defended from the compression of the halter, by the protuberance of the *aspera arteria*, whereas the jugular veins "lie almost naked under the skin." I confess, indeed, that the carotids are more internal than even the internal jugular veins are: I add also, that they resist compression more, by reason of the thickness of the coats, and the impetus of the blood, with which they are distended. Yet the internal jugular veins are certainly, also, somewhat defended by the jutting out of the *aspera arteria*, and doubtless cannot be said to lie almost naked under the skin, though the external jugulars undoubtedly do. And it is certainly proper, in this place, to consider the internal chiefly, where the question is of bringing back the blood from the brain, and not the external. And, indeed, I have shewn above (z), that in the experiment of Aristotle, it was not the external, but the internal, which were constricted, as they follow the course of the *aspera arteria*: and this may also be confirm'd from what Harderus (a) found to be the consequence of tying up the external jugulars, in a mastiff; for when he expected a sleepiness from thence, with an epileptic stroke, nothing at all of this kind appear'd. Yet there are some who refer to this place that other experiment of Galen, which I mention'd before, together with the first (b).

But as the design of Galen, in that experiment also, was to tie up the vessels, "which join the heart to the brain," I cannot be induc'd to believe, that the external jugulars, and not the internal, were constricted by him. - Yet you will here readily reply, how could it be, that, if he had tied up the internal veins, he from thence found "no function to be evidently lost?" especially as Aristotle has affirm'd, that the senses were by this means taken away. Shall we believe both, or shall we believe neither of them? for Rolsinc gave credit to neither (c). And Harvey (d) has pronounc'd, that another experiment of Galen's, which in like manner related to the sanguiferous vessels, was never actually made. But softly, I beseech you, especially when the question is of such great men, lest, through incautiousness, we devise more or less for them, than they have intended to say. As to Rolsinc, he did not only say, that he distrusted the experiment of Galen, but even all the other experiments. Yet he denied none of them, but only weaken'd the force of some, by the same plea which I mention'd a little before, that whether the arteries or the veins be tied up, the vertebral veins always remain, which cannot be tied. And if Cæsalpinus had observ'd this, he certainly would not, in behalf of Aristotle, have objected to the former experiment of Galen (e), "that the ancients had not only call'd the arteries

(z) n. 21.

(a) Eph. N. C. Dec. 2. A. 3. obs. 115. in
Scol. fine.

(b) n. 24.

(c) Dissert. Anat. l. 6. c. 44.

(d) De Circ. sangu. Exerc. 3.

(e) quæst. 15. cit. supra, ad n. 21.

“ carotids, but likewise, all the veins that go to the head;” as if, truly, Aristotle could have been able to constrict them all in the same manner. But let us consider Harvey by himself.

30. I wish he had, in regard to that experiment, in which a pipe being introduc'd into the artery, and no ligature being previously made round the vessel, Galen (*f*) has affirm'd, that the artery pulsated below the pipe, but that a ligature being applied, it did not pulsate; I wish, I say, he had only broken the force of it, by shewing the cause of the fallacy not being observ'd by Galen, and had not written, that Galen, and Vesalius, “ not thinking of, “ or not understanding, the difficulty ” of that experiment, which they do not say was tried by them, had propos'd it to be tried by others, and in that circumstance, had not undertaken to demonstrate “ the error of Vesalius, and “ the inexperience of others.” For if you read Vesalius (*g*) attentively, and still more if you read Galen, you will perceive, that both of them have spoken with such affirmation, that it is customary for no man in his senses to do, except who has made the trial of the matter, and is prepar'd to demonstrate that experiment to every-body who chuses to ask it. Nor was it necessary to accuse others of “ inexperience ” in this manner, as if the propos'd administration was almost impossible; and besides, if you made the ligature tight, the artery would be dilated above, and the flux of blood being, for that reason, restrain'd, the artery would pulsate very obscurely below: but, if you loos'd the ligature, the whole of the operation would be thrown into confusion by the effusion of blood springing forth from the wound. For, to pass by Sanctorius (*h*), who, before Harvey wrote, testified, that he had, also, “ made trial of ” this experiment of Galen, on brutes; at least, Vieussens (*i*) perform'd it afterwards with success; nor when he had tied the ligature, did he see, that the flowing of the blood was prevented, but even that the artery pulsated below the tube, with almost equal strength, to what it did above; nor when he had soon after applied no ligature, was the other experiment confounded, by the effusion of blood, which experiment Sanctorius (*k*) says, was also propos'd by Galen, in the same chapter as the first, in which chapter I do not find any such thing.

But both of them, you will say, turn'd out contrary to the opinion of Galen. I confess it: nor was it ever my intention to defend him. This one thing only I intended to shew, that there was no occasion to call the credit of Galen into question, as if he could not have perform'd that experiment, which others could perform. For that he, and Sanctorius, might have been deceiv'd in the operation, because the ligature being tight, for the reason taken notice of by Harvey, or any other of that kind, the artery would pulsate so obscurely, that it would not seem to pulsate at all, I should so much the more readily grant, as I the more plainly see, that Harvey himself also, not having observ'd all the cautions which Vieussens since inculcated, had seen it pulsate much less than he. One caution, however, which has been omitted, is the reason why the experiments do not answer so well, as I

(*f*) An sanguis in arter. &c. c. 8.

(*g*) c. 9. cit. supra, ad n. 29.

(*h*) Comment. in I. Fen. I. Can. Avic. Doctr. 1. c. 2. & quest. 121.

(*i*) Neurogr. l. 1. c. 4. (*k*) locis modo cit.

have formerly experienc'd in that of Pecquet (*l*); not to digress too far from the subject of the sanguiferous vessels, and the blood that is mov'd in them; in which he wrote, that the crural artery being tied up, the blood that flow'd from the turgid cavity of its correspondent vein, when incis'd, "first flow'd out by drops, its impetus being greatly diminish'd, and at length entirely stopp'd;" but when the artery was relax'd, "that it burst out again from the vein with equal vigour." Yet as the greater part of those things, which I then observ'd in two dogs, together with Homob. Piso, a celebrated physician and professor, and a man of great condescension and kindness towards me, are publish'd by him, and set forth in a clear light (*m*); it will be sufficient here to take notice, that neither part of the experiment answer'd in those animals. For the blood, indeed, sprang forth from the vein, when the artery was untied, with greater vigour than just before, when it was tied; and yet not with equal force, to what it had before it was tied: but when the artery was tied (which Piso attended to chiefly) the impetus of the blood was broken, indeed, in its motion; yet it did not cease to flow in the first dog, who was more sprightly and strong, copiously, and with a kind of jerk, and in neither of them did it distil in drops, and still less not at all: nor could the flux be entirely stopp'd; in one of them, before a ligature being drawn under the artery and vein, which were rais'd, as you see in the figure of Walæus (*n*), I order'd it to be drawn tight about the thigh: For as I observ'd, that in this dog also, the experiment had the same success; I did not doubt but Pecquet had by chance lit on a dog, in whom as the other branches, which arise from the artery above the ligature, and communicate with the crural vein, were smaller and fewer than in ours, it happen'd to him, that he saw something different from what we saw, for that reason: or even, perhaps, that he made the ligature higher than we made it, as the place of applying it, with us, was a little below the groin. Wherefore you understand, that Pecquet ought not to have omitted, in what place the artery, or the thigh, were to be bound, if he would have others see the same things, which he had seen; although indeed, sometimes, the author of any experiment, suppose, for instance, Valsalva, has omitted no circumstance in describing it; yet without any advantage; for they who repeat it, evidently change something, and then, as if they had made no change at all, wonder that their experiment does not answer! But of these things in another place, or rather, in no place at all.

31. Perhaps you think that I have digress'd farther from my design, than there was occasion. And yet I have not digress'd. For my design was, that after I had weigh'd well the experiment of Galen, concerning the ligature of the carotid arteries, I should see also about that other experiment of his, which consists in the constriction of the internal jugular veins, without any function being evidently lost therefrom. And although this might seem difficult to be believ'd; I have, nevertheless, taken pains to shew, that the credit of his experiment was not to be call'd in question too hastily; but we ought rather to see, whether by the omission of any caution, he admitted any

(*l*) Dissert. de Circul. sangu. c. 1.

(*m*) Nov. in sangu. Circul. Inquis. c. 7.

(*n*) I. in Epist. I. de mot. chyl.

error common to humanity; as for instance, if, perhaps, those veins being scarcely tied, he had presently taken off the ligatures, or had kill'd the animal, without regarding the appearances, which might have follow'd, if the experiment had been a little longer protracted, inasmuch as he fought against the force of the heart, which, if it had been sent from thence into the brain by the veins, certainly would have been, as he contended in a similar circumstance (o), "transmitted in a moment of time." And this I say the more confidently, because when he spoke of tying up the nerves (p), or arteries (q), in the neck of an animal, he expressly said that he protracted the experiment; yet, in regard to the veins, as far as I know, he wrote nothing of that kind. But, if he had mention'd this experiment, made upon the veins, frequently, as he did those on the arteries, and nerves, it would have been more easy to judge of this matter. As far as I remember, at present, however, he spoke of it once (r) only; and I am sure he has not mention'd it again, in the twenty-third chapter of the book *De Pulsuum Ufu*, although Salius (s) hints at it.

But he has neither said, in what kind of animals, nor in what part of the neck, he tied up the veins. Both of which circumstances were proper to be consider'd, by those who would call his experiment into question. For as to what relates to the first, the more modern authors have generally made the experiment on dogs; and how seldom he dissected these, even when dead, no one can be ignorant, who is vers'd in his writings: but what living animals he made use of, for these experiments, as far as relates to the nerves, we know (t); as to the sanguiferous vessels, however, if I remember rightly, we are ignorant: and yet, who can deny that there may be a different disposition, or communication of the vessels, in different species of animals? since it is not uncommon in the same species, and even in one and the same animal, by comparing the vessels that lie on the right side, with those of the left, to find a variation in their disposition. Wherefore, it is proper to consider, also, the other circumstance, that is, in what part of the neck, the jugular veins have been tied. And that there is a difference even in dogs, betwixt an inferior, and a superior situation, either from the cause just pointed out, or from some constant cause, you may conjecture from the experiments of the celebrated L'Amur (u).

For this gentleman, while he was enquiring into other things, happen'd to consider the internal jugular veins of many dogs, and had them tied up, in two of these animals, for a short space of time: in the first of them (x), after the ligature had been made below their bifurcations, he observ'd no sleepiness at all; but in the second (y), when the ligature was made as near to the thorax, as it could possibly be, the dog, says he, "fell into a profound sleep." I wish we had more of these observations, and continu'd for a longer time; so that we might, by comparing the old ones of Galen, and the new ones, with each other, as we did in those above, draw some more stable conjecture, in relation to this experiment, from thence. But none occur at present, except

(o) An sangu. in arter. &c. c. 8.

(p) De Hippocr. & Plat. Decret. 1. 2. c. 6.

(q) Vid. supra, n. 24.

(r) De Aff. particul. c. 2.

(s) cit. c. 6.

(t) Vid. de Anat. Admin. 1. 8. c. 8. & 1.

de Præcogn. ad Posth. c. 5.

(u) loc. cit. supra, ad n. 24.

(x) Exp. 3.

(y) Exp. 4.

one or two, which I shall produce below (*z*), and which are rather favourable, than repugnant, to Galen. And indeed, those are favourable to him, which I pointed out above from Emmetus, and in particular, from the celebrated Van Swieten (*a*). For the last of these gentlemen testifies, "that he tied up the jugular veins, without any observable evil;" and moreover, "that after four days, he found the dog entirely healthy, and found." Nevertheless, as in these very dogs, the carotid arteries were tied at the same time, or had been tied before; you see plainly, that these experiments were not quite the same as Galen's. The other experiments that occur, evidently relate to the external jugulars: and although I know that these communicate with the internal, and for that reason, as well as by their own office, do, not a little, contribute to the more expeditious return of the blood, from the interiors of the cranium; yet I do not think that they are at all to be put in competition with the internal, in this office; and indeed, Harderus having tied up the external veins, in a dog, not only did not see the symptoms of the brain being injur'd, or oppress'd, as I have said above (*b*), but also found in the brain, upon dissection, "only a small quantity of extravasated blood, nor yet any traces of grumous concretions in the sinusses, which," *says he*, is a very strong argument, that when this passage was shut up, "nature prepar'd itself another way, especially through the internal jugular veins."

The lectures of Boerhaave, indeed (*c*), mention the experiments of Drelincurt, from whence it appears, that the external jugulars being tied up, the dog has a stertor, tumour, and suffocation come on. But if they refer to the fourth experiment (*d*), in this we read, that four other veins, to wit, the crural, and the axillary, were tied up at the same time, and in a dog, which had been, already, tortur'd for three days together, by one experiment or other. But, perhaps, other experiments are alluded to, which escape me; or, perhaps, those might even be intended, which Drelincurt had by him in writing, as is hinted at the latter end of those which he has publish'd. For in that place, and elsewhere (*e*), these same lectures suppose other experiments of Drelincurt, in which, besides the carotids, the vertebral arteries were also tied, which I do not remember to have read, among those he has publish'd; nor do I remember the experiment of Steno, spoken of in another place (*f*). "in which it seem'd that the animal was made apoplectic, from the constriction of the jugular veins;" unless we, perhaps, suppose, that the author of these lectures, though a very great man, by giving them extempore, depended on his memory; which, as generally happens in things of this kind, must sometimes fail him.

32. Yet there are some, who may seem to refer the experiment of Lower (*g*) to the internal jugular veins; whereas Lower by no means says that; and what he observ'd in the living dog, and sought for in the dead, show'd no injury of the brain. For at length, "after some hours, all the parts above the ligature were wonderfully swell'd, and, within two days, the dog dy'd suf-

(*z*) n. 32.

(*a*) n. 24.

(*b*) n. 29.

(*c*) in Instit. § 860.

(*d*) n. 2.

(*e*) § 695.

(*f*) § 286.

(*g*) Traët. de Cœde, c. 2.

"focated,

“focated, as it were, with an angina, while not only the tears flow’d very copiously, through the whole time, but also, a great quantity of saliva from the mouth:” and after death, the parts under the skin were found swell’d, that is to say, “all the muscles and glands were greatly distended with limpid serum;” so that there seems to be a considerable similitude, in most circumstances, betwixt this dog, and the first of them, in which I have said (*), that the carotid arteries were tied up by Valsalva; nor is this observation, perhaps, to be explain’d otherwise, than as will be hinted at presently, for many reasons, but especially by reason of a certain experiment of Jo. Bohnius (b). It were to be wish’d that Peyerus (i), (for he also, in like manner with Lower, saw “a great quantity of water” collected here and there, under the skin of the head, in the adipose membrane, and the interstices of the muscles”) had particularly said, which of the veins he had tied up in the dog; for he has only said, that he tied up the “jugular veins.”

Nor has Harderus (k), the intimate friend of Peyerus, spoken more clearly, where he has affirm’d, almost in the same words, “that others had remark’d the same with him:” although it is most natural to suppose, that he did not mean any other than the external veins, as he had expressly mention’d, some years before, in the passage I pointed out above (l). But Pechlinus seems to have understood Lower otherwise. For as you have it in the Sepulchretum itself (m), he says, “I have known for a long time, by a common experiment, that when the internal jugular veins are tied up, in a calf that is half dead, the brain is copiously inundated with stagnating serum.”

Finally, the celebrated Oederus (n), having tied up the external veins in a dog, tells us, that he made these observations: “That the veins above the ligature did not swell much, nor did the dog suffer much apparent injury from the operation, nor did he become stupid, but through almost the whole day was brisk, and continually barking, and surviv’d to be the subject of another experiment. A portion below the ligature, which disappeared upon every respiration, was at length fill’d again.” Whether he did not, probably, write “inspiration,” you will perhaps determine from what will be produc’d below (o). However, he also complains much of the want of perspicuity, in the narration of Lower; his words are, “When he says that he tied up the jugular veins, it is uncertain whether he meant the external only, or not.” And, indeed, Novesius seem’d, formerly, to have understood both (p), as he put ligatures round both the internal and external. And having done this in one dog, and even in a second, in like manner, he observ’d (which I do not find in Lower) signs of the head being made more pond’rous, and some tears; but the dogs dying after some time, he found no extravasated serum, either on the inside, or on the outside, of the cranium: and he judg’d, that if all the jugular veins, and their branches, were tied up, the circulation of the blood would be continu’d, though more

(*) supra n. 25.

(b) Circ. Anat. Prog. 6. in cane quarto.

(i) Meth. hist. anat. med. c. 6.

(k) Apian. in schol. ad obs. 72.

(l) n. 29.

(m) l. 1. S. 16. obs. 5. in Additam.

(n) Dissert. de Derivat. &c. § 33.

(o) n. 33. & seq.

(p) Lettr. de G. Desnoes IV.

slowly, inasmuch, says he, as it returns by the sinus of the medulla spinalis. And I very well remember, that when Novesius related these things to me, and Valsalva, at Bologna, which he soon after publish'd, he subjoin'd, that when he tied up those veins, he took great care not to tie up any thing but the naked veins themselves: and he therefore suspected, that Lower had tied up the adhering lymphæducts together with those veins, and that these being ruptur'd from too great a plenitude, had giv'n rise to that quantity of limpid serum. And this suspicion was not disapprov'd by Valsalva, and might even be confirm'd by a certain observation of Drelincurt (*q*). However this is, at least the observations of Novesius shew, that Galen might have seen no injury, worthy notice, a little after he had tied up the internal jugular veins, since Novesius observ'd no more, when the internal and external were both constricted.

33. You will, perhaps, ask, what the experienc'd man Valsalva observ'd when the same veins were constricted. And as I lately examin'd all his papers with care, for this very reason, though I found nothing relating to the tying up of these veins, I found other things, nevertheless, which, as they relate to the same veins, and to the carotid arteries, that were open'd, or laid bare, in living dogs, I shall not think it any trouble to describe, in this place, to you, as I promis'd in the former letter (*r*), and to tell you also, at the same time, in a few words, what has appear'd to me from repeating the same observations. Valsalva, therefore, having cut open the skin in the neck, and laid bare the jugular veins, observ'd that these vessels, which were turgid with blood, became less tumid, when the dog inspir'd; but in expiration, that they again became turgid, especially when the respiration approach'd more nearly to its natural state: and he saw the same afterwards, also, in other dogs, and a kind of systole and diastole in those veins. Besides, by compressing them, he saw the blood, which was below the compress'd part, flow back towards the heart, though it was not urg'd from above.

In another dog, he cut asunder the carotid artery, and saw what he expected, from the higher communications of the branches of both carotids, one with another, that blood flow'd also from the upper part of the dissected artery, and that not in a small quantity, but with less impetus from the lower part.

These things, however, which he observ'd of the carotid artery, and those which, in the second place, he remark'd of the jugular veins, were in general known, indeed, at that time to all, but, I believe, not in that very manner which he observ'd them equally known to all. But as to those which he observ'd, in the first place, of the jugular veins, they would, perhaps, have been known to no-body, even at this time, if the observations of the celebrated Schliëtingius (*s*), which were publish'd in the year 1750, had not put several persons upon enquiring, why the brain is rais'd up in every expiration, and subsides in every inspiration. For when men of great sagacity enquir'd into this cause, at Gottingen, and Montpelier, they lit on the same observation as Valsalva did formerly, and extended the same motions of the

(*q*) *Experim. Anat. Canicid.* 6. n. 4, 5.
(*r*) *N.* 11.

(*s*) *Memoir. present. a l'Acad. R. des Sc.*
Tom. 1.

veins, which, as far as I know, had been seen by no body till that time, besides Valsalva, to other larger veins, by the diligence of their own experiments. Which one thing I was willing to add, as I revis'd this letter, to the others that I had written to you so long before; and yet not, for that reason, omit any thing of those which will immediately follow. At first, indeed, they will not seem to correspond with the great number of continu'd experiments, which were made by Valsalva, and by other very excellent men, whom I have mention'd, and whose experiments I esteem, as faithful and true. But they are not for this reason to be pass'd over; and I even think it ought not to be conceal'd, in the first place, that among so many anatomical experiments of this kind, one may be extant, which is not repugnant to those things which reason, and even the eyes themselves, shew to exist in the bodies of living men sometimes, that is to say, when the veins swell at the time of inspiration, and are depleted at the time of expiration: and secondly, that the very ingenious writers of these experiments may be able, if they please, to determine properly, every one from their own explications, what is the cause of so great a difference between their experiments and mine; whether it is the same, which I see is mention'd (1) to explain what I said was seen in living men? or another cause, which, if you read attentively what I saw immediately from the beginning of every inspiration, may better agree with these observations?

34. For when I repeated the experiments of Valsalva, which I have a little before describ'd, about the end of the year 1723, I made these remarks. The integuments, on the right side of the neck, being so separated, and drawn back, in a dog, that the whole of the external jugular vein, which had been cover'd by them, lay quite bare, a tremulous kind of motion was seen in it, as there was also in the neighb'ring part of the neck, as much of it as was laid bare. Soon after, fixing my eyes attentively on the vein, and applying my hand to the abdomen, I very evidently perceiv'd, that as often as the muscles of this part were rais'd by inspiration, that vein, at the same time, immediately became tumid, nor did its tumour decrease before the abdomen subsided in expiration; for at that time, also, the turgescency of the vein manifestly decreas'd. And as these things were contrary to the observation of Valsalva, I observ'd them so much the more diligently again and again, and took care that they should be observ'd by those who were present, among whom were those accurate and skilful anatomists, Vulpius and Mediavia, and other very learned men, besides a number of students: and the experiment always succeeded as I have declar'd to you: and there seem'd the less danger of falling into error, in proportion as respiration, in both its parts, or inspiration, at least, was great, and of long continuance, and, in alternate order, always similar to itself; so that there was no difference in its state, through the whole of the observation. And I wish'd, indeed, at that time, respiration might at length return to its natural state, that I might more certainly compare my observation with the observation of Valsalva. But now those reasons, for which I have not conceal'd this experiment, make me

(1) Vid. Walstorff Dissert. sist. Experim. circa mot. cerebri &c. § 28.

the more disappointed, that the natural state of respiration did not return. Nor indeed could I see any other systole, or diastole, of the jugular vein, besides these; and perhaps Valsalva, under these names, signified that subsiding and turgescency of the jugular vein, corresponding with the alternate parts of respiration. But in the remaining observations, there was nothing at all repugnant to the observations of Valsalva. For having constring'd the nearest and upper part of the vein, by pressing my finger upon it, in such a manner, that I divided the upper column of blood from the lower entirely; the blood, nevertheless, which was below my finger, flow'd down within a short space of time, and left the vein empty, or almost empty.

Finally, these things which I have said, being seen again, and often, one of the carotid arteries on the same side was laid bare, and disjoin'd from the neighbouring parts; after that it was a little rais'd, and cut asunder transversely, at about the middle of the neck longitudinally. As we were in doubt, whether blood flow'd from the upper part immediately after dissection, as it certainly did from the lower; we thought proper, in order to remove this doubt, through the rest of the observation, that the celebrated Vulpius, who stood by as an assistant, should hold both parts of the artery, which was cut asunder, between his fingers, but one in one hand, and the other in the other, that they might not fall together, and at the same time, should incline one a little to this side, and the other a little to that, to prevent the blood of one part meeting the blood of the other, and so confounding our observations, but that it might be very easy to observe the difference between the upper and the lower part. And this he having done almost sooner than it was said, it was very evident, that the blood sprang forth from both parts, to a great distance, although in a smaller thread, and with less impetus from the upper part, than the lower; and this we continu'd long, and according to our pleasure. Yet the upper stream was not of so remarkable a smallness, that the reason did not sufficiently appear, why Galen had admonish'd us even of old (*u*), in those experiments, in which the sanguiferous vessels are cut asunder in the neck, "that to prevent the animal from immediately perishing, in consequence of the immoderate profusion of blood," had admonish'd, I say, that "we should previously tie up the neck, both in the upper and the lower part, with very tight ligatures;" that is to say, they being drawn across, behind the aspera arteria, "and then cut through that part of the vessels, which is intercepted betwixt the ligatures." And this circumstance being sufficiently attended to, it was found that the inferior part of the artery contracted itself, in such a manner, where it was cut, that scarce any thing flow'd out of it. But a little of the same extreme part being laid hold of, with the forceps, the blood immediately return'd to its former manner of streaming forth: whereas, in the mean while, the mastoid muscle, which we had before cut across, in the middle of the neck, had not contracted the dissected parts towards its extremities; so that, without applying any force, you might bring one part close to the other, by laying hold of them with the hands, and they lay contiguous to one another, as they had done before; the dog at that time being so strong and vigorous,

(*u*) Cap. illo 6. cit. supra, ad n. 31.

that

that, all these things being sufficiently inspected, the abdomen open'd, many parts in the belly examin'd, and some ligatures made round the vessels, when the thorax was at length laid open, the heart even at this time beat strongly, and regularly. But these things belong to other places.

35. Now let us return to our first design (x): from which I am pleas'd to have withdrawn you, by a prolix recital and examination of experiments; for it is far less melancholy and dreadful to be detain'd long in the consideration of dogs, which are tortur'd by experiments, than in the consideration of strangulated men. But we must now return to this subject, being about to judge of the causes which are generally assign'd for their deaths, since we have now gone through the consideration of all the experiments, both of the ancients and moderns, that are necessary hereto.

To the nerves therefore, which accompany the blood-vessels in the neck, being constricted with the halter, I do not see that any one, at this day, refers the sudden death of these strangl'd persons: and if any did, I should recommend to them the consideration of those ancient and late experiments, which are pointed out above (y).

Nor, indeed, do I think there are many, who account for it from the compression of the carotid arteries; and yet I think that if those things were consider'd, which are just now propos'd (z), and explain'd at large, these gentlemen would be greatly in doubt how to determine.

But on the contrary, I know that the greater part agree with that very learned man, who, after Wepfer (a), taught, in more than one place, that the return of the blood was prevented by the striction of the jugular veins, as the blood is still carried to the brain, by the carotid arteries, which are not entirely compress'd, and still more by the vertebral arteries; and that, for this reason, a fatal apoplexy is immediately brought on, "nor is there any other reason for the death of persons who are hang'd;" for the blood, they say, being thus congested in the brain, consequently brings on a violent compression, and perhaps even the tender vessels are ruptur'd, and the blood is effus'd into the ventricles, and the convulsions of the brain.

But can there be more blood carried into the brain, than when no compression is applied to the carotid arteries, or its return be more hinder'd, than when ligatures are separately applied round each jugular vein, and not only about the internal or external only, as was done in the experiments of Galen, or Harderus, Oederus, and perhaps even of Lower, but about the internal and external both at one time, as I have told you that Novefius did? And did any one of these gentlemen see, any apoplexy I will not say, but any sleepy disorder, which immediately, or soon after, follow'd? Read their experiments over again, I beseech you, that I have pointed out above (b). You will certainly find, that nothing of that kind was seen: or if it has happen'd sometimes, to some other persons, that they have seen otherwise, from a constriction of the veins, nerves, or arteries in the neck; I would have you call to mind, that when I speak here of the death of hang'd per-

(x) Supra, n. 20.

(y) n. 23.

(z) n. 24. & quinque seqq.

(a) Exercit. de loco aff. in apopl.

(b) n. 29. 31. 32.

sons, I enquire into the causes, not that sometimes only, but that always, or almost always, and speedily, kill. What is then the case? Are there other causes beside those we have just examin'd, which we should rather accuse? as, for instance, the luxation of the upper vertebræ, which some now suppose (*c*), and Wepfer (*d*), at his time, seem'd to suspect, when the executioner leaps upon the shoulders of the persons who are hang'd, and with his foot pushes the head in a transverse direction. But this method is not in practice every where, and where it is, there Columbus so far denied (*e*) his having found a luxation, that he asserted a fracture of the vertebræ to be much easier than a luxation; and at length, whether you would choose rather to suppose a luxation, or a fracture, from either of these, a compression of the spinal marrow must happen at its beginning; and from this cause, immediate death, rather than an apoplexy, would follow. And lest you should reply, that an apoplexy must then follow, since the vertebral vessels are also compress'd, either by the luxation, or fracture, of the vertebræ, or so injur'd, that the blood cannot be carried into the brain, and brought back from it, even by these channels; let us then omit the consideration of such cases, which I have said are not common to all hang'd persons, and certainly were not to those, who had recover'd from their apoplexy, or rather from that sleep with which they had been seiz'd, after hanging, and let us at least see, by what means we may say, that sleep which is common to all is brought on; for there is no doubt but the same cause which brings on this sleep, if it be suddenly and violently applied, will soon kill the man.

36. Cæsalpinus (*f*) says, "they who have not died in consequence of being hang'd, relate, that as soon as ever the halter was tied, they were seiz'd "with a stupor, so that they, at length, felt nothing." Wepfer also (*g*), speaking of a man and woman who surviv'd hanging, tells you, that the woman lay like an "apoplectic person," forgetful of every thing; and that the man "had not suffer'd the least pain, after the constriction of the halter,—and had pass'd some hours, buried, as it were, in a profound sleep." And I myself have heard, from a grave and credible man, that a certain criminal, who, as was suppos'd, for the same cause with those, of whom Cardanus speaks in the Sepulchretum (*h*), could not be entirely put to death by the executioner, related to those who question'd him upon the subject, that at first he found a kind of sparks flying about before his eyes, and soon after that he felt nothing, or at least nothing but as if he was asleep. And this case is much like that related by Bacon (*i*), except that he who had hang'd himself, after "an appearance of fire, now began to see "darkness," that is, nothing at all, when being immediately taken down from this very short suspended state by a friend, he began to see a somewhat pale colour; yet felt no pain. Finally, I saw a woman whom thieves, that they might rob the house safely in the night, had bound about the neck with a twisted handkerchief, in such a manner, that they did not doubt but she was dead.

(*c*) Vid. supra, n. 14.

(*d*) Exercit. cit.

(*e*) n. 14. cit.

(*f*) l. 2. Quæst. Med. 15.

(*g*) Exercit. paulo ante cit.

(*h*) l. 4. S. 12. obs. 11.

(*i*) Hist. Vit. & Mort.

This woman was found with her face swell'd, and livid, and her mouth very frothy; which I take notice of for this reason, that you may understand in regard to the aphorism which mention is made of above (*k*), that it is, as many others frequently are, to be admitted with some exception; for she was sav'd by the industry and care of the physicians, blood being taken from her arm and foot, and such medicines as are call'd cardiacs being administer'd, as soon as it was possible to get them down; by which method of cure, you will find in Riolanus (*l*), and Bacon (*m*), that other strangulated persons generally escap'd, fomentations and warm baths being added; this woman, therefore, after she began to be a little reliev'd, by taking off the handkerchief, lay many hours, even then, before she return'd entirely to herself. You see, I mention many examples, that you may not be in any doubt, what is common to strangulated persons, and may, at the same time, observe, by considering over again the experiments made upon dogs, which I have set before you, whether any thing of that kind has happen'd when the nerves, the arteries, or the veins, have been tied up in the neck of these animals. And if this has not happen'd in any of them, or even if it has not happen'd in the greatest part of them, the cause of suffocation must be sought for elsewhere.

37. And to me, indeed, it seems, when I consider all these circumstances, that something still remains, which might be enquir'd into by experiment; that is, whether it would happen otherwise to dogs, if not any vessels singly, but all the vessels in general, were tied up by putting ligatures on them. For, that different circumstances may take place, when any particular vessels only are constring'd, from what must happen when they are all tied up, is not only confirm'd by reason, but by experience. And as you may see what happens, when the nerves, or arteries, singly are tied, not only from the present letter, but, also, from the thirteenth of my *Epistolæ Anatomicæ*, you will also see in the same place (*n*), how dissimilar the symptoms are, and how much more violent also, that have happen'd from both being tied up at once. Call to mind, likewise, those circumstances which I have mention'd above (*o*), in relation to the she-goat of the mountebanks, and of the young men of Assyria and Pisa, that both the one and the other fell down, having their senses and power of motion suspended into a profound sleep. But the goat certainly fell down in this manner, when the bandages, which were thrown round the vessels and nerves, that pass together through the neck, were drawn tight; and it is not to be suppos'd, that it was in the power of mountebanks, to distinguish veins and arteries from each other; so that it is most probable they were all compress'd together. Nor indeed is it in the power of anatomists themselves, in so great a vicinity of nerves, and vessels of both kinds, and I may even say, in so great a cohesion, to compress the one rather than the other, without wounding the skin: nor does Columbus seem to have done otherwise (*p*). And we must suppose the same, finally, of the experiments of Aristotle (*), who, though by his words he means the jugular veins, and those the internal, yet says, "that they were laid hold of,

(*k*) n. 9.(*l*) *Anthropogr.* l. 1. c. 18.(*m*) *Hist. modo cit.*(*n*) n. 31.(*o*) n. 22.(*) *Vid. supra*, n. 21.(*p*) *ibid.*

"or constricted, on the outside, while the persons, so laid hold of, fell down, "bereft of their senses, and having their eyelids compress'd." And, indeed, Salius (g), speaking of these very things, does not doubt but the veins, arteries, and nerves, were compress'd altogether. And Riolanus (r) having quoted that passage of Aristotle, says, "that it is not certain amongst antient "authors, in regard to the vessels, which of them, by being obstructed by "ligatures, bring on sleep; because those vessels, veins, arteries, and nerves, "are so contiguous one to another, as to have been mistaken for each "other."

38. Besides, as it is obvious that in strangl'd persons, of whom the question is chiefly at this time, not only these vessels in general, but the aspera arteria, at the same time, is constring'd; why may we not suppose, that this cause, in particular, is to be added to the others? Nor, indeed, is there any occasion to make experiments, in order to prove, that the effect proper to the total obstruction of this canal, is speedy death. The case itself has happen'd frequently: as when Drusus, the son of Claudius Cæsar, who was not arriv'd at the age of puberty, was suffocated "by a pear, which had "been thrown up to some height in play, being receiv'd in his open mouth," as Suetonius (s) records it; or when a robust young man, of whom you read in the Sepulchretum (t), "was suffocated, by respiration being suddenly "lost," from a bit of meat having fall'n into the larynx, and totally stopp'd it up: and this was so sudden, that there was no time to have the assistance of a surgeon. I would to God, such accidents might very seldom, or never, happen, and that Petit the surgeon (u), and lately, also, the illustrious Haller (x), to pass over others, had not had so many sudden deaths to relate, from a cause of this kind. Wherefore, it is not to be wonder'd at, that many, even among the more modern writers, as Dionis (y), Langguthus (z), and others, have suppos'd, that the death of hang'd persons is owing to this one cause only, that respiration is intercepted; and that many celebrated men have at length pass'd over into that opinion, to whom it seem'd before, that this was to be accounted for, rather, from the jugular veins being obstructed, than from the use of the air being impeded.

And lest you should object to me with Wepfer (a), that men who dive, and hysterical women, live without respiration; although he does not deny that the last breathe at all, but to outward appearance only; know, that I am not willing to dwell on these points at present, nor to dispute about the particular utility of the air, which we inspire; but only am willing to say this, that if a compression made on the nerves, and vessels, at the same time, be not thought sufficient, of itself, to produce that effect, whose cause we are now enquiring into, yet it is certainly sufficient to produce this effect, when a constriction of the aspera arteria is added. For that circulation of the blood through the brain, which, when the carotid arteries, and jugular veins, are compress'd, can but just be preserv'd, in some measure, by the vertebral ar-

(g) De Aff. Partic. c. 2.

(r) Anthropogr. l. 3. c. 9.

(s) De duodec. Cæsarib. l. 5. c. 27.

(t) Sect. hac 2. obs. 6.

(u) Mem. de l'Acad. R. des Sc. A. 1742.

(x) Opusc. Pathol. obs. 7.

(y) (z) locis supra indic. ad n. 24. & ad n. 9. Vid. § 5.

(a) Exercit. cit. supra ad n. 35.

teries, and veins; and if respiration be totally impeded, this also is certainly prevented. For the air, that was lately drawn in by the lungs, dilates itself, and, because it cannot now return from that warm place, as it us'd to do, more strongly compresses the small vessels, which carry the blood through the lungs, so that it must of consequence stagnate in a large quantity, in the lungs; the right ventricle of the heart, and the vena cava, as Thomas Cornelius (*b*), in fact, found, in animals who dy'd with the air confin'd in their lungs. And this having happen'd, the blood is at the same time withdrawn from the vertebral arteries, which they carry to the brain, and at the same time the return of that blood, which had flow'd into the brain, from the veins that correspond to these arteries, into the sub-clavians, is more difficult, inasmuch as the cava, into which these veins open, is so distended, in strangl'd animals, with the blood which, as I have said, stagnates there, that, according to the observation of the same Cornelius (*c*), it is sometimes ruptur'd.

But I do not now say, that no blood passes through the lungs, immediately on respiration being impeded; but that it passes in less quantity, and after that in less, and less, so that what does pass, cannot be sufficient to preserve the circulation; nor is there time in this case, as in hæmorrhages, for the arteries to contract themselves more, and more, to accommodate themselves to that small quantity of blood; but in the mean while, the right ventricle of the heart is so dilated with blood, that it cannot presently constrict itself, nor drive on even a small quantity of blood, through the lungs, to the left ventricle, and the arteries. And if impeded respiration, therefore, of itself, and in a short time, prevents the circulation of the blood, it must of course be prevented, in a much shorter time, through the brain of those, in whom, by reason of the carotid arteries, and the jugular veins, being, at the same time, constricted with the halter, so little blood is carry'd to the brain, as to be barely sufficient to keep up, in some measure, the circulation of the vertebral arteries and veins. But if it happen, at any time, before the transit of the blood through the lungs be altogether impeded, that for those reasons which are above mention'd (*d*), some blood may still continue to flow through the carotids, which are less compress'd, than the jugulars are; not only the circulation through the brain will stand still, but the blood itself will be accumulated in such a quantity, as soon to occasion a rupture of the vessels, which happen'd in that woman, whom, as is before related (*e*), two men had strangl'd, by grasping her neck with their hands. For in her, Littre found blood extravasated upon the basis of the cranium, and in the ventricles: and his explication does not much differ from this of mine. And according to this explication it may, in like manner, be understood, why, in a thief who was hang'd, and whom Peter Nanni dissected, when I was at Bologna, the longitudinal sinus of the dura mater was ruptur'd: and still more, why Lancisi (*f*) saw, in persons who had been strangl'd, "bloody points which appear'd in great number, and variegated the white substance of the medulla

(*b*) Progymn. 7.

(*c*) *ibid.*

(*d*) n. 29.

(*e*) n. 9.

(*f*) De Subit. Mort. obs. 4. in fin. ad n. 8.

“ of the brain :” and why I myself saw all those appearances, which I have before (g) describ'd to you, in the brain and lungs of a certain maniac, who, from the universal testimony of these appearances, was destroy'd by the same kind of death.

39. This would be a proper place, also, to speak of those persons, whose sudden deaths most people account for from a more dense, or more rare air being taken into the lungs ; that is to say, from the first constringing, in the same manner as I explain'd before, the small vessels of the lungs, and the latter not explicating or unfolding them ; so that being collaps'd, and corrugated, they are by no means in a proper state to transmit the blood : although, by the experiments of the celebrated Greenwood (h), the air of a well, in which the men who went down were destroy'd, or a lighted torch let down was extinguish'd immediately, was found to differ from the common air, neither in density nor gravity, neither in humidity nor elasticity. But notwithstanding deaths of this kind happen frequently, and I myself, in the year 1731, answer'd for the sacred college of physicians at Padua, what was to be done, lest that should happen again to those who go down into a certain sepulchre at Esté, in the republic of Venice, which had lately happen'd to three men, I mean, that they were immediately suffocated ; yet, as no carcass of a person, who was taken off by a death of this kind, has been brought to Valsalva or me, in which we might examine the state of the viscera and blood, I pass over this disquisition at present. But if you should ask me, why I take upon me to say, that those three persons were suffocated, I should answer, that I take upon me partly for this reason, because a bearer who went down into this vault five or six months before, was immediately seiz'd with a tightness of respiration, and also because one of those three persons sent forth a kind of howling, as he died, and the rest were writh'd with certain motions, like those who are suffocated, and one of them had even a livid and black body.

Nor did it happen very differently with those ten, who went, one after another, into a wine-cellar at Verona, that was full of the steam of the fermenting grape : for every one of these persons underwent the same fate, some of them making a noise, like howling, or bellowing, and most of them throwing themselves upon the ground suddenly, and agitating themselves like persons who are suffocated. And in the cave, which, among the Neapolitans, goes by the name of the Dog's Grotto, the learned Leonard Capuano (i) testifies by his experiments, that the beasts fall down immediately just as if they were dead, except that most of them agitate their limbs, and writhe themselves, in a miserable manner. And that you may not suppose these agitations of the limbs rather to be convulsive motions, by reason of the brain being primarily affected, than such as are customary in those who perceive themselves to be suffocated, observe what follows in the work of Leonard ; I mean, that the animals being taken from thence, half-alive, into the wholesome air, are restor'd in such a manner, that they do not seem to have suffer'd any disorder : that those animals, which do not naturally breathe,

(g) Epist. 8. n. 4.

(h) Saggio delle Trasfraz. Tom. 5. n. 2.

(i) Delle Mofete Lez. 1.

are destroy'd very slowly, and with great difficulty: that a dog, which died in this grotto, had his lungs somewhat contracted; and frogs, that died there, had their lungs collaps'd, and empty of air. All which I was willing to take notice of here, lest you should readily believe what you will read in the Sepulchretum (*k*), that those who are destroy'd by the vapours of new wine, or with the fume of charcoal, "die very placidly; which also happens to " dogs that die in the cave which is call'd *la grotta de' cani*, or the Dog's " Grotto:" for if all these animals died of an affection of the lungs, rather than of an affection of the brain, " they certainly would be troubl'd with " a tossing of the arms, a drawing up of the legs, and finally with an agitation and struggling of the whole body." Thus far the Sepulchretum. But in this grotto, also, the height of the mercury in the barometers is not alter'd by the deadly vapours (*l*): nor in this only, for the barometer discovers no change in the cavern of Pyrmont (*m*), the phenomena of which are very similar to those of the Neapolitan grotto. And what has been observ'd without dissection, or by dissection, in the bodies of those who have been kill'd by the steam of charcoal, or any well, the *Commercium Litterarium* (*n*) will teach you, and still more the History of the Academy of Sciences at Paris (*o*).

40. But although neither I, nor Valsalva, have had any opportunity of dissecting the bodies of persons who had been drown'd; yet as I have formerly dissected various kinds of animals, which I had taken care to have drown'd, I will not conceal what observations I have made. For following the example of Galen (*p*), who " was accusom'd to take " for dissection an ape that had been " suffocated in water," I was not afraid, lest, for that reason, they should swell too much, or grow putrid too soon: for they who are afraid of these things, mean, I believe, those carcases which have been long in water; so that some causes ceasing, which kept the internal air compress'd, it disengages, and expands itself, as I chuse rather to suppose with the celebrated Senac (*q*), than to account for that enlargement of bulk from water entering the pores of the skin, on which account the bodies of drown'd persons rise from the bottom of the water, and swim on the top. Nor did Jacobus Sylvius (*r*), I suppose, who prefer'd the bodies of men that had been drown'd to others, wish for any but fresh bodies; for the reason he gives is, that in these bodies every thing is found, " if you discharge a great " quantity of water, through the œsophagus, from the stomach, by compressing it with your hands:" although this very exception of Sylvius will often seem to you but little necessary, as the observations of many persons are against it. For Platerus, as you have it in the Sepulchretum (*s*), having sometimes experienc'd it, found only a little water in the stomach of these bodies; so that he rather thought their death had been owing to water, instead of air, falling into the *arteria alpera*. But Wepfer (*t*), in a drown'd

(*k*) Sect. hac 2. in Schol. ad Obs. 15.

(*l*) Vid. Mead de Venen. Tent. 6.

(*m*) *Commerc. Litter.* A. 1737. Hebd. 8.

(*n*) *Ibid.* A. 1736. Hebd. 14. n. 2.

(*o*) A. 1710. Obs. de Phys. n. 5. & A. 1701.

(*p*) *De Anat. Admin.* l. 1. c. 3.

(*q*) *Hist. de l'Acad. R. des Sc.* A. 1725.

(*r*) *Agg. Anat.* l. 3. c. 23.

(*s*) Sect. hac 2. Obs. 44.

(*t*) *Eph. N. C.* Dec. 1. A. 2. Obs. 251.

beaver, found none at all in the lungs; and Waldschmid (*u*) at length confirm'd, "that not the least drop of water was ever to be found in the stomach, or thorax, of drown'd persons," many other observers afterwards assenting thereto, with Beckerus (*x*), either in men, or in beasts, till Litre (*y*) asserted, that he had found a little water in the lungs of drown'd men, and a great quantity in the stomach.

41. It happen'd to me to observe the following things in the creatures that I shall tell you of. Two guinea-pigs, male and female, the first of which, that was also the biggest, liv'd longest in the water, had no water either in the stomach, œsophagus, or aspera arteria; only a frothy humour was press'd out from the lungs with the hand. As a person who was present doubted whether the water had not flow'd out, unobserv'd, from the œsophagus, and particularly from the larynx, while the pigs were taken out of the water, I order'd a third to be suffocated, in like manner, and to be taken out of the water, by being laid hold of by the head, so that nothing could flow out; yet the appearances were the same as in the two first, nor did any thing come out from the lungs, when compress'd, unless a white watery froth, nor that in great quantity. I did not find the epiglottis, which is in these animals very short, depress'd, so that the entrance into the larynx lay quite open.

Hedge-hogs, also, had this part short and open. In three of which animals I enquir'd after the same things that I did in the pigs. The first of them, being taken out of the water with the caution before-mention'd, had a small portion of frothy and watry humour in the stomach, but scarcely any in the lungs, which were flaccid. As this, which had seem'd to be dead before, shew'd itself alive under the knife, I would have the others, which were male and female, be detain'd longer under water; for they endeavour'd to get from under water with great violence, and especially the female, though the least, just as the former did. And while they were under water, I observ'd that all of them, but the female most of all, sent forth, every now and then, aerial bubbles out of their mouths, which reach'd to the top of the water. In the stomachs of these creatures, when dead, was no water: but a little froth could be drawn out, by pressure, from the lungs, which were of a whitish colour. These hedge-hogs were, as the former was also, of that species, which are most like to dogs in the nose; and for this reason I wonder'd the less, that the hairs, which cover'd the neck, chin, breast, and the part of the abdomen that lay beneath it, besides the arm-pits, and the groins, were fill'd with fleas, just as in any dog: and these two I dissected about the end of May. But in the first, which I dissected in the latter end of October, I wonder'd a little to find a living worm within one of the bronchia, which was oblong, slender, and white; whereas in that part, or in the other parts of the lungs, the aspera arteria, thorax, œsophagus, stomach, and intestines, all which I open'd, and diligently examin'd, I could neither find any morbid appearance, nor any other worm; and the hedge-hog itself was strong and lively, as it was possible to be. These circum-

(*u*) Earund. Dec. 2. A. 6. Obs. 153.

(*y*) Hist. de l'Acad. R. des Sc. A. 1719.

(*x*) Traët. de Submers. morte sine potu aqua.

stances, though they do not much belong to the present design, yet as I lit on them at the same time, I was not willing to pass over; that you may compare this with the worms, which our ancestors (z) have asserted to be cough'd up from the lungs, whether you suppose them to have been generated there, or rather to have come thither from some other parts.

In a mole, with which great pains had been taken, in order to suffocate it in water, and which I, notwithstanding, dissected half-alive, the stomach contain'd but little water; and from the lungs, which were in other respects turgid, not water, but a frothy humour, was express'd. In a domestic mouse, neither the stomach, nor the lungs, had any part of the water within them, in which the creature had been suffocated. Nor did I find it otherwise in the dormouse of our country, who died the same death; for although the stomach, which was somewhat flaccid, contain'd a fluid, yet this certainly was not water. I also found the larynx of this creature not shut up, and the epiglottis so low, that it scarce appear'd. And although I do not mention, in regard to each drown'd animal which I dissected, that the epiglottis was not depress'd, and the larynx not shut up; yet I would have you understand, that there was not one of all these animals, in which I examin'd it, wherein I did not find it in the same state.

42. And as I remember'd, that, at another time, when, for other reasons, I was about to dissect a young whelp, and two cats, which had been born the night before, the first had liv'd a long time in the water, but that the two last, after great pains had been taken, for a long time, to suffocate them under the water, had begun to creep about the anatomical table, after they were brought to me; I resolv'd to try, in new-born kittens, how long they would live in water, but especially to see, when they were at length dead, what water they contain'd in the stomach and lungs. Having seen, therefore, that two, which had been born twelve hours before, were alive, and swimming in the water, for about half a quarter of an hour, I was tir'd of the delay, and order'd them to be plung'd under water, and held there. And after this was done for some little time, I presently saw them floating on the surface of the water without any motion; so that they were suppos'd to be quite dead. But having left one there, I dissected the other, and observ'd motions in its whole body, and especially in the heart. Yet neither in the stomach of this, nor of the other, which died a little after, did I find any thing but milk half-coagulated, so as to resemble the second sort of cheese. But the lungs of each were quite fill'd with bubbles, which shone through the external membrane: and I suppos'd, that the water had enter'd by the larynx, which I had found not to be shut up by the epiglottis, and confirm'd the same by dissection: for a great quantity of moisture came forth, in a frothy state, from the several sections which I made, and with this the lungs had been distended.

Having begun to dissect, at another time, as many cats, that had been born forty hours before, and were not drown'd with the hand, but left so long in water as till they seem'd to be entirely dead, which happen'd in a

(z) Vid. apud Schenk. Obs. Med. l. 2. ubi de Pulmonib.

short time, although I in fact found one only to be dead, that had been the longest time in the water; yet I saw those bubbles through the whole lungs, in both of them; but found these viscera to be full of air, rather than of moisture. And the stomach of that which was half-alive when dissected, contain'd a little water; but the stomach of the other was greatly distended with it, which it certainly had not drunk, before I order'd it to be kill'd: and both of them were brought to me, in order to be dissected, with the head upwards, and laid hold of; that you may not suspect, as is the custom with most persons, that any thing had flow'd back from the stomach of the first.

I also dissected two other cats, which had been kill'd in the same manner, after being only a few days old, and had been taken out of the water, in the same manner as the others; I found a watry humour in the stomach of both, not in a very inconsiderable quantity, and press'd out much white and watry foam from the lungs.

Finally, I dissected four cats, which had been brought forth the night before; and although I had order'd, with a view to some particular experiments, that they should rather be vehemently fatigu'd in the water, than suffocated; yet I was willing you should know, that the stomach, in all of them, was swell'd, to a very great proportion, in its magnitude, partly indeed with milk, that was half-concreted, but with a great quantity of water also.

43. From all the observations advanc'd, when compar'd one with another, it appears, in the first place, that not much assistance is to be expected, in order to avoid suffocation, from the foramen ovale being open, nor yet from the canalis arteriosus being in the same state: in the second place also, that in cats newly-born, no small quantity of water has gone down into the lungs, and often a great quantity into the stomach; whereas, to the greater part of adult animals, neither of these circumstances has generally happen'd. And Litre (*a*), having kill'd a number of both cats and dogs, sometimes found nothing at all in their stomach, but always much less water, than in the stomach of drown'd men; for he had been accusom'd to find a great quantity of water, in human bodies, which I also said above (*b*); so that it does not seem, that he ought to have been reckon'd, by a very learned man, among those who have taught the contrary: for he even plac'd the observations of Beckerus, who had found no water in the stomach, or in the lungs, among the more rare cases; in which circumstance, however, I fear I shall not be able to agree with Litre. For if to Beckerus, we join those whom Charisius (*c*) has commended, and those whom I have commended above (*d*), Platerus, and Wepfer, and those that Charisius might have added, Kulmus (*e*), and Leprotti (*f*); we have from these, doubtless, and others, such a number of observations, that they cannot be call'd so rare; especially after the Royal Parisian Academy of Sciences itself, in that excellent admonition, which it took care to make public, in the year 1740, upon the method of

(*a*) Hist. cit. supra, ad n. 40. A. 1719.

(*b*) eod. n.

(*c*) Specim. de Morte Submersi. § 10. ad e prim. & secund.

(*d*) n. 40.

(*e*) Obs. adject. Descrip. Fœt. monstr. § 2. 3.

(*f*) In Epist. post Comment. De Bonon. Acad. Tom. 1.

assisting such persons, as are suppos'd to be drown'd, expressly acknowledg'd it to have been found from the dissections of drown'd persons, by skilful anatomists, that but little water was, for the most part, contain'd in their stomachs. And to these you will, moreover, add the observations of others, to say nothing over again of my own. Among which, we must by no means omit those that were made by very celebrated physicians (*g*), in order to examine the assertions of Beckerus. And as he had advanc'd, "so they found the thing to be, and met with no water in the stomach of drown'd whelps;" and although they do not deny that water, "under some certain circumstances, may sometimes enter into the canals and vesicles of the lungs," yet they affirm, "that in general, drown'd bodies are wont to die, without drinking the water." Nor are these words of the very experienced Haller (*h*) to be pass'd over: for after having himself plung'd under water, some whelps, he says, "It will not be foreign to the purpose to take notice, that in living whelps, which had been thus plung'd, both the lungs, and the stomach, were free from water, even when they had gap'd under water, and put out their tongues. So far Beckerus is to be depended upon."

But as I quoted these passages, that you might understand how far it does not seem, that observations of this kind can be number'd among the more rare cases; so, on the other hand, I would not only have you not forget those observations, which are of an opposite nature to these, but would have you know, that other observations are, moreover, extant, besides what I have mention'd; as, for instance, some that are very accurately pointed out by Charisius (*i*), and others that you may add thereto, from Genfelsius (*k*), who nevertheless excepted the lungs, as also some that are propos'd by Olaus Borrichius (*l*). For as to what he had formerly written, that a boy, who, when swimming, was carried away by the waves of the sea, and sunk in the very deep, so as to be found with difficulty, was presently snatch'd from sudden death, by being roll'd about by a great number of persons; you will perceive that it relates to the present subject, for this reason, because by a vomiting, which took him in the midst of these rotations, "he threw up a great quantity of the salt water."

And indeed, the same Haller, whom I just now commended, found in a woman, whom he dissected in the year 1747 (*m*), and in one dissected in the year 1748 (*n*), (both of whom had been very long under water) by compressing the stomach, and the lungs, that the water had descended into the stomach, in both of them, and in one, saw the water regurgitate from the lungs. And although, where he purposely treats of this subject (*o*), he does not mention the former, so that from the error of the printer, in marking the year, two may seem to be made out of one; yet he adds new experiments of his own, on four drown'd dogs, and one cat, by which, if you ex-

(*g*) Vid. *Commerc. Litter. A* 1737. Hebd. 37. n. 1. ad 2.

(*h*) *De Respir. Exper. P. 2. ad n. 39. not. i.*

(*i*) cit. § 10. ad *f* prim.

(*k*) *Eph. N. C. Cent. 6. obs. 85.*

(*l*) In *Bartholin. Act. Med. Hafn. A.* 1671. & 1672. obs. 95.

(*m*) not. *i* cit.

(*n*) *Opusc. Pathol. obs. 62.*

(*o*) *Ibid.*

cept the cat, he found water in the stomach of all these animals; and in the lungs of all, the cat not excepted, he found much watry foam. He then adds other experiments, which I shall take notice of below, that are frequently confirm'd, in the same manner as the former, by his celebrated auditor Evers (*p*). Whose writings on these matters, I would willingly have had publish'd, long before I could have revis'd this letter. For I find the experiments made with such care and skill, that you might perceive whether the animals breath'd under water, and swallow'd; nor could it be doubted, whether they had taken down the water into their stomachs, and lungs, as it was purposely ting'd with a certain colour. And it was found by dissection, that they had taken the water down into both. Had all of them? you will ask. Yes, one and all. Which I know you will be surpriz'd at, especially in so great a number of experiments; you, who esteem as true and faithful, so many and various observations of others, which do not assent thereto, no less than these latest of all, who do not easily, as I suppose, imagine that the force of these contradictory experiments can be sufficiently evaded, by supposing it to have happen'd so, at that time, because the water, being then very cold, had prevented deglutition and inspiration. Nor, indeed, did the experiments, on occasion of which, Haller found no water any where in the whelps, that had been plung'd thereinto, mention that the water was very cold: nor did I ever use any for this purpose but what was lukewarm: nor was the young man of Leprotti; to omit others, who have been snatch'd away by the same kind of death, in Italy and France; drown'd at the time of year, when the waters are very cold with us; yet in the stomach was scarcely any moisture found, and in the lungs "not the least drop," into which it might have descended by the nostrils at least, if not by the mouth.

44. But how must we account for these differences, that are to be found, not only among the different observations of different authors, but even among my own? Have they, who had no water in the lungs, and the stomach, shut up the entrance of the larynx, and œsophagus? and have they who had a little, or large quantity, not shut up the entrance of these passages? for there are some, I see, who have explain'd it from the different resolutions of persons, when they were plung'd under the water; and in this manner, that they who have heard of drown'd persons dying from the great quantity of water that is swallow'd, closely shut up the entrance; and they who have heard that their death is owing to the want of respiration, open it. But although these different contrivances cannot obtain in beasts; we nevertheless find that the circumstances are different, in different animals also. And even suppose, that different men would have different devices: yet how can they shut up the larynx, who intend to do it? Is it by constringing the glottis? But how shall they keep it constring'd, as, when respiration ceases, the influx of spirits, into the constringing muscles, ceases also? And I make the same objection, if you say that these men depress the epiglottis, so as to cover the larynx entirely; although I do not sufficiently allow of such muscles, that are able strongly to depress this valve.

It remains, therefore, for you to have recourse to convulsion, by the force of which, these muscles, and those that shut up the œsophagus, remain contracted, even after death, just as the muscles, which bring the lower jaw close to the upper, were actually contracted, in the case of that young man, whom Plancus dissected with Leprotti (q): for the mouth, as this celebrated man wrote to me, about the fortieth day afterwards, that is, on the seventeenth of May, in the year 1722, the mouth, I say, was, after death, kept very closely shut. But I found neither the larynx shut up, nor the epiglottis depressed (r), in those animals into whose lungs the water had not fall'n, even after death: nor did Littre find it otherwise, in any of his drown'd creatures (s), he, who, in other respects, thought that the epiglottis was depressed, not only in those of whom we speak, but even in those who were thrown into the water, after death, advancing, in this manner, a supposition, that was neither credible, nor coherent, with the things he had laid down; for how could the tongue, which he had suppos'd to be at length relax'd, in living persons, and to fall forwards, raise itself up in dead persons, in order to depress the epiglottis backwards, or be kept in that position? To this also may be added, that the tongues of the guinea-pigs, in whose lungs I have said (t), that I found no water, are oblong indeed; but, if you except the first part, it is so fix'd to the basis of the mouth, that it cannot raise itself, and depress the epiglottis, which is, in other respects, very short, so that it can scarcely cover the whole hiatus of the larynx. And what will you say to this? that amongst "those things which are commonly seen and observ'd," in the bodies of drown'd persons, is plac'd by Charisius (u), "the tongue thrust out:" for the epiglottis, by reason of the connecting ligaments, "necessarily follows" the tongue, when thrust out, to use, in a well known circumstance, the equally well-known words of Palsin (x). And most of these things, you may think, are said by me, not so much from the opinion of Littre, as on account of that of Dethardingius (y), and his followers. For they do not doubt, but that respiration is intercepted, and the water excluded, by the stricture of the epiglottis, to the orifice of the larynx; as if it did really happen, that the air and water were excluded in all: and yet there is not one of them all, who says that the epiglottis has been found depressed, in the dissection of drown'd persons, by themselves, or by others: but on the other hand, even Evers (z), in all his experiments, always saw the glottis open, and the epiglottis rais'd, just in the same manner as I did, and as he did likewise in a boy (a), whose lungs and stomach the water had enter'd into.

Yet Dethardingius, taking for granted what I have mention'd, has pronounc'd that the chief assistances, which can be giv'n to persons that have been drown'd, are those whereby the epiglottis may be rais'd, or if that cannot be done, to open another passage for the air, instead of that which this cartilage shuts up. That this cartilage, therefore, is to be irritated, by im-

(q) Epist. cit. supra, ad n. 43.

(r) n. 41.

(s) Hist. cit. ad n. 43.

(t) n. 41.

(u) § 8. Specim. cit. supra, ad n. 43.

(x) Anat. du corps hum. tr. 3. ch. 8.

(y) Sched. de subven. submersis per larynxotom.

(z) Dissert. cit. supra, ad n. 43.

(a) § 7.

mediately putting the finger into the throat, or rather a feather, or pencil made of bristles, and that it is to be excited, even after the aspera arteria has been open'd, under the larynx, the finger being now and then apply'd to the wound, or a cough excited, that by one method, or other, the epiglottis may be rais'd by the impell'd air. The greatest part of which, if what he suppos'd were so in fact, I should certainly approve as much as he; did not a more speedy, and, at the same time, a more certain, method appear, from what has been just now said, of raising this cartilage when depress'd, I mean, immediately to draw the tongue forwards, by laying hold of it with your fingers.

But although the epiglottis is not depress'd, there may nevertheless be room for the operation of bronchotomy, propos'd by Dethardingius, when other remedies are of no effect, which are mention'd in great number, in the Monitum I have commended (*b*), either for that cause which is pointed out in that very Monitum, of opening a nearer passage for warm air into the lungs, by means of a pipe; or if you choose rather to think with the more modern authors, that the water, which has fall'n into the lungs, may have a more speedy passage to go out: although they so far confess, that they have us'd not only this, and other methods which are not common, but even the most curious that have been propos'd by any one, upon a great number of dogs, but in vain; for notwithstanding these animals had not been detain'd more than eight minutes under water, yet they could not be recall'd to life; so that they take away from us almost all hope of relieving human creatures that have been drown'd. If, as they have treated their subject methodically, nervously, learnedly, and ingeniously, so they had had time, a great degree of which was certainly necessary, to weigh separately every example of those drown'd persons who have been recall'd into life, as they say, they would, perhaps, have found a greater number of methods than they seem to believe, which give us hopes of assistance even by remedies, sometimes, not very curious, and that where submerison does not happen in cold water, or that which is mix'd with ice, from whence both deglutition of the water, and inspiration, might be said to be hinder'd.

You will read, for example's sake, in the epistle of the celebrated Languhanus (*c*), publish'd at Gottingen, in the year 1748, that a man, who lay under water "for about half a day," so that not the least sign of life remain'd, "had recover'd his life again, in a short time, merely by having "the spirit of salt armoniac applied to his nostrils." You will read also, in the seventh volume of the *Acta Casarea Natur. Curios. Academie* (*d*), from the observation of a cautious physician of Breslau, nam'd Kundmann, how two persons, whose heads had been held down under water, the one almost a quarter of an hour, the other almost half an hour, in a river, were excited in a short time, by remedies that were not very violent or exquisite. And, not to collect more together, I would have you just read over again, how easily that young man was snatch'd from death, whom I have mention'd above from Borrichius (*e*). Shall we say, then, that they were all drown'd

(*b*) N. 43.

(*c*) De Causa a pastu somnolentia.

(*d*) Obs. 124.

(*e*) N. 43.

in cold water, and that for this reason they did not take it into their stomach, or lungs? Certainly, we cannot say that this boy of Borrichius was, who, although he liv'd in a cold country, "would not have indulg'd himself in "swimming," with his companions, unless the time of the year had been such, that the water was lukewarm; nor could he, when sunk therein, have taken it down plentifully into his stomach, upon their supposition. As to the other three, I do not see, that particular notice is taken of the time of year in which they were drown'd, except that Kundmann writes, in relation to one, that it was "on the eve of Easter;" and of another, that a troublesome cough having attack'd him soon after, "he often threw up grumous blood "from his lungs," which you may consider as a proof of his having taken in water, that had injur'd the very tender vessels of the lungs. You see that I do not mention examples which are less credible, nor in great number, nor little known; but a few only, and those such as are obvious to every one, and that none of them are taken from the warmer or more temperate regions, in which, as the custom of swimming is much more frequent in these countries, and especially in summer, so I do not doubt, but you will find a great number of examples, if you enquire after them. For hence it seems to have been, that the Roman physician Zachia (*f*) was the more easily induc'd, in regard to the recovery of a young man, who was drown'd, and taken out of the river an hour after, confidently to assert, "that it was certain, not only "of this restitution, that it ought not to be consider'd as a miraculous effect, "but that it ought not even to be enumerated among those events which are "wont to excite the wonder of the hearers."

But to return to our former subject, from those things which have been produc'd by a desire of enquiring out the truth in a matter of the most serious consequence, and not by a desire of contradicting, why then, you will at length say, if in all drown'd persons a passage lies free, through the open, and in-no-wise-protected, glottis, into the lungs, does not the lukewarm water, at least, enter the lungs equally in all? The celebrated Senac (*g*) will explain this to you, to whom I willingly refer you, as I am hast'ning on to other subjects. He will, at the same time, inform you, which is indeed a consequence of the other, that the mark which is commended also by Littre (*b*), in order to distinguish those persons, who are thrown into the water alive, from those who are thrown in dead, by the water being fall'n inwards, or not fall'n inwards, which is in other respects easy, and in medical questions, relating to judicial affairs, not without its advantage, is is not to be consider'd altogether as perpetual.

45. But I know that you are here going to interrupt me, though I am in haste in regard to that other mark, which relates, at the same time, to these questions, and at the same time to suffocation, which is our present subject; I mean that mark, which is taken from the lungs of an infant, being thrown into water: so that, from these falling to the bottom, or swimming at the top, it may be distinguish'd, whether the child was born dead or alive. What would you have me say? I am of opinion with those, who make use of this.

(*f*) Quæst. Med. Legal. Tom. 3. Consil. 79.

(*g*) Hist. cit. supra, ad n. 40.

De. 1.1.

(*b*) Hist. hoc n. cit.

sign, indeed, but cautiously, and prudently. For I know, how many exceptions have been observ'd, within a short series of years. And although Galen (*i*) pointed out, that the substance of the lungs in foetusses was not only red and dense, but also "heavy," contrary to what it was in those who had breath'd; and tho' others observ'd the same afterwards, and among these our Spigelius (*k*) repeated it; yet I do not know, whether any one, for that reason, ever thought of making the experiment on this account, except a few lustra before my age. At least, no mention is made of it in Zacchia, much less in Fidelis, and Parey, even in those places where it was natural to expect it.

I see it therefore objected, that the lungs of an infant who was born alive may, nevertheless, subside in water, if they have either been not sufficiently distended from a want of strength in the infant, or have been made heavy from disease, or from suffocation itself: and that on the other hand, the lungs of the infant, who was born dead, may swim on the surface, if they are distended with air, which either putrefaction may have discharg'd, or itself may have drawn in, before it came into the world, or some person afterwards, in order to excite respiration, has blown in, through the mouth. And these, and any other dangers of deception whatever, it is necessary to know, and to be cautious of, in the manner which will be immediately pointed out.

46. And first, there is no reason to doubt of what that very grave man, Laurence Heister (*l*), testifies his having seen (for as to some other observations, not much unlike this in other respects, as far as belongs to the crying of the infant, I see that they depend upon a forc'd testimony of contemptible women) that an infant, after living nine hours, weakly indeed, and continually sending forth feeble lamentations, the lungs, which were in other respects found, appear'd just in the same manner, as in those who never breath'd, and subsided in water, as they are wont to do in this kind of infants: which ought not to seem very wonderful, if you observe with this author, whom I have already commended (*m*), that air sent by us, into the lungs of a foetus, in small quantity, and with little impetus, is unequal, as he has often found by experiment, to the task of expanding so many vesicles of the lungs, as is necessary, in order to render them specifically lighter than water. And this being the state of the case, before we argue, from their subsiding, that the infant was born dead, we must enquire into the marks of its weakness, from the foregoing or present disorders of the mother, from the difficulty of the birth, from the state of the child's body, after death, and other things of that kind: and if there be none of these things, and no other argument, to the contrary; we shall not doubt but the child was born dead.

Yet on the other hand it will be evident, that we cannot trust to the sign in question, if at any time we should observe, that the lungs are not endow'd with that gravity which is natural and peculiar to a foetus, but with a morbid gravity; either because they are schirrhous, or because they are inflam'd, or because they are so far affected, with some kind of infarction or other,

(i) De Usu Part. I. 15. c. 6.

(k) De form. Foetu c. 18.

(l) Dissert. de fall. pulm. infant. exper. n. 10. & seqq.

(m) Ibid. n. 16.

that

that if they were even the lungs of an adult man, they nevertheless could not swim, on the top of the water, which most anatomists, and I also, sometimes, have experienc'd. For that in foetusses, there may be sometimes infarctions of this kind, is not only indicated by reason, but confirm'd by experience, as, for instance, in the observation made by Zeller (*n*), on a calf, which had liv'd half an hour.

But finally, if suffocation itself can, sometimes, fill the lungs with so great a quantity of blood, in an infant, as I have mention'd that they have been overwhelm'd with in strangl'd adults, from the observation of others, and particularly of Harvey (*o*); yet suffocation will not be able to hide itself, under the sign in question. For although all the external marks thereof should be wanting, yet certainly a different state of the lungs from that which is usual in the foetus, and the enlarg'd bulk besides, would admonish us, that although they did not happen to swim in water, we should not be too hasty in trusting to this sign. Besides, it can scarcely happen, in those who have drawn in air, but that some small parts of the lungs shall retain so much of it, as to make them swim, though the other parts descend; so that these parts are to be examin'd into, by cutting the lungs piece-meal, and throwing them separately into water, as well as by other means, and these both in this and the two former cases, that we may not be easily drawn into error, from the subsiding of the lungs.

47. But on the other hand, that we may not be impos'd upon, by the swimming of this viscus; we must, particularly, attend to this, that although learned men have not been wanting, who have seen the lungs of foetusses fall to the bottom in water, even after the highest putrefaction has taken place, we cannot, nevertheless, deny the truth of the assertions of those persons, who affirm that they have seen the contrary: amongst whom is the celebrated professor Weissius, whose observation if you read (*p*), you will readily confess, that the lungs of a sinking foetus, who was never able to draw in air, "were spongy" to the touch, and "swam on the top" of the water, for no other reason but because they were already "infected with putrefaction," which discharg'd the air. And I should suppose that Frederic Ruysch (*q*) had a view to the same thing, when he wrote, "that the lungs, when properly form'd, would never swim upon the surface of water, if the foetus should die in the womb of its mother," where he complain'd of them who disputed this circumstance with him formerly, which controversy is, perhaps, the same with what Boerhaave has made mention of, in some part of his lectures (*r*). When therefore we find, that the lungs are not "in a good state," but tainted with putrefaction; we must not, although they swim in water, for that reason, pronounce the child to have been born alive.

And much less still, whenever there may be a probable suspicion, that amidst the throws of a very difficult birth, the foetus might have drawn in the air by means of a rupture of the membranes, before it could be possibly extruded, by reason of that delay, and by this means have died in the

(*n*) Disput. quod pulm. infant. in aq. &c.

Vid. Hist.
(*o*) n. g.

(*p*) In Medit. Behling, sup. cas. rupti in partu uteri.

(*q*) Theat. Anat. V. n. 40.

(*r*) Prælect. ad Instit. § 691.

birth, as Palfin (*s*) also, among the rest, has admonish'd: although it can scarcely happen, that in this case, and the last preceding, we shall be deceiv'd by the craft of an old woman, since both of them require helping hands, nor the circumstances which precede, or accompany, or are the consequence of them, can be easily either conceal'd or dissiml'd.

But on the contrary, it would be very easy for the woman to call to mind that last circumstance, that she, when her child was born dead, thinking it half-alive, had blown air into the mouth very strongly, that it might be excited to respiration: and that for this reason, the lungs were distended with air, and swam on the surface of the water. And indeed, as the minds of some men are prone to all kinds of wickedness, some man or woman, into whose hands the child was receiv'd in a state of death, might, with a malicious intention against the woman, have done it, privily to all persons present, in order to scandalize the poor mother, as if she had destroy'd the child, when it was breathing. But if there are no marks of internal or external force having been applied to the child, when yet alive; for the marks of force applied to the dead infant, and especially not immediately after death, are very different; we may from thence disprove the calumny, and so much the more readily give credit to the mother, who says that she blew air into the lungs, if none of the other circumstances argues the contrary, nor the distension of the lungs is greater, than can really be brought about in that method, in a foetus recently dead, or that has not been dead long, as will appear by experiments carefully instituted for that purpose: although I think these things ought to be touch'd upon by us, rather that they may not be entirely unknown to physicians and judges, than that they should come to the knowledge of the common people, as nearly the same prudence and caution is requir'd in regard to this subject, as in regard to what it is necessary to say upon poisons.

48. Here you have a method of using the experiment in question, cautiously and prudently. But if I seem to you to have explain'd these circumstances too little at large, you may compare them with what has been written more at large by the celebrated Michael Alberti (*t*), who, in like manner, as Heister (*u*) did also, thought that the experiment was not to be rejected, but made use of with circumspection. And you will see that the opinion of those prudent physicians Beherensius (*x*), and Trew (*y*), and of others, was the same, and that we may not seem to have entirely omitted the Lawyers, of Schoepffer (*z*) also, in turning over whose works, you will not only know what authors have treated of this subject, besides him, but will particularly know what relates to the circumstances of the affair, whenever you have regard to the other signs of infanticide, and by what means these are also to be examin'd, that we may not be deceiv'd. For whether they are absent, or present, they add to, or take from, the force of the experiment: which, at other times, for the most part, answers, as it did even

(*s*) Tr. 3. *supra* ad n. 44. cit. c. 9.

(*t*) Dissert. de pulm. subsid. exprim. prud. applic.

(*u*) Dissert. *supra*, ad n. 46. cit. n. 22.

(*x*) Aët. N. C. Tom. 2. Obs. 28.

(*y*) Eorund. Tom. 8. in Schol. ad Append. n. 3.

(*z*) Dissert. Jurid. de pulm. infant. natant. &c.

with me lately, in a cow-calf, that had double lungs, as it had also two heads, two necks, and two hearts. The lungs of this calf were contracted, dense, and of a red colour inclining to black; and when they were even cut into pieces, and thrown into a proper quantity of water, for a small quantity may deceive us sometimes, I found, from their immediately going to the bottom, that the calf had been born dead, though some had asserted in writing, that it had stood up when it was born, and had liv'd some hours. The truth of the story being diligently enquir'd into, according to my desire, from one who had been present at the birth, I was certainly inform'd, by other letters, that it had really been born dead. But of the other circumstances which I saw in the dissection of this animal, I shall have a proper opportunity of speaking hereafter (*a*). But now I shall, at length, pass on to the other species of suffocation (*b*), I mean, that which is from internal causes; and shall be so much the shorter on this subject, as I have been the more prolix on the other.

49. An old woman, who had a cancer, that had crept from the left angle of the mouth, which it had consum'd, farther into the mouth, and under the tongue, being subject to disorders of the thorax, which she call'd of the catarrhus kind, died of suffocation. On dissecting the body, I found the larynx and its neighbourhood sound, and yet there was a purulent ichor under the glottis, and in the nearest part of the aspera arteria; and the same within the upper part of the left superior lobe of the lungs, and in other parts thereof. But the inferior lobes were vehemently inflated. Wherever I cut into the lungs, I found them of a cineritious colour, which was here and there distinguish'd by black lines, and ramifications of the small vessels, wherein the blood stagnated. The heart, also, was full of black blood, which was not, indeed, altogether coagulated, not yet without polypous concretions; and one of these, being in its form and whiteness like a worm, reach'd into the pulmonary vessel. The coronary veins, and all the jugulars, and the branches of those that ran through the neck, were also greatly distended with blood. I found one valve of the great artery beginning to ossify; and I saw the same degeneracy in several places on the internal surface of the same artery, as far even as to the iliacs.

50. This woman brings back to my memory, the man whose body I dissected, about the same time, in the same place, that is, in the hospital of Incurables at Bologna. For he also had an ulcer in the mouth, but in the more internal parts, and the larynx and the aspera arteria were in like manner uninjur'd, and the same part of the lungs as in this woman was to the last degree disorder'd: and he also died in the manner of a suffocated person. But what remains of his history I reserve, till I come to treat of deglutition being injur'd; for as to the other circumstances, which I just now took notice of, and by what means his lungs, as well as the lungs of this woman, might have been disorder'd, I have pointed out in a former work (*). These persons, therefore, were suffocated from a disorder of the lungs, as others have been from a disorder of the larynx, and aspera arteria, concerning which, be-

(*a*) Vid. Epist. 48, n. 57.

(*b*) Supra, n. 2.

(*) Epist. Anat. 9. n. 9, & 10.

sides what you will read from Platerus (*c*), and Kerckringius (*d*), I shall write to you more properly on another occasion (*e*), and indeed have already written (*f*). But I shall here add no other observation besides this, except that which I receiv'd from the very experienc'd Santorini, on the same day that he had made it. And it relates to suffocation from a disorder of the great artery.

51. A virgin, who, for some time before, had but little discharge of blood from the uterus, at the time of her monthly evacuations, was troubl'd with a difficulty of respiration, and at length was suffocated, as if by convulsions. The abdomen being open'd, a tubercle was observ'd externally, in the substance of the uterus itself, like to that kind of soft tumour, which, in the Italian language, is call'd *natta*, or a soft tumour of the wenny kind. But when the thorax was open'd, the beginning of the great artery was found to be of such a thickness, in its parietes, that the capacity of the vessel was greatly diminish'd thereby. In this artery was a great quantity of blood; but a still greater in the lungs, which were quite over-loaded with it.

52. Whatever was the cause of this thickness in the parietes of the artery, that diminish'd, in such a manner, the capacity of the vessel, an example of which, in other arteries, you have from Littre (*g*); it is evident, that by reason of the artery being made narrower than its natural state was, the blood could not be sent out from, and circulated through, this artery, in so large a quantity, or with so much force, as naturally it is. For which reason the blood was found here, but in far greater quantity in the lungs, in the vessels whereof, so much more was of necessity collected, as so much a less quantity could be sent into the aorta. From the narrowness, therefore, of this artery, not only the difficult respiration, especially in the motion of the body, but at length the suffocation, arose. But of this subject enough. It remains, that instead of writing a particular letter, on account of these few things which I have to say on the subject of coughs, I rather add them to this, as I promis'd in the beginning.

53. Some causes of a cough, like those of lost respiration (*b*), are without, and some within, the lungs. And of the first class, some are on the outside of the thorax, and some within. And again, of those that are on the outside of the thorax, some are in the head, and others in the belly, and still others in the neck. And as a cough may arise from causes that are so different, and have their situations so different; it is, at some times, to be compar'd with those fevers which they call corruptive fevers, and then only, with salubrious and depurative fevers, when it has its origin from matter, which may be discharg'd by the force of the cough itself. For although a fever and cough are both of them, by themselves, evils, yet both of them are then causes of good: wherefore both of them arise from the very nature, and constitution, of the body, which we call, in general, nature, and are never suppress'd, but with the worst of consequences, as they were both much to be desir'd, supposing them to have been absent. For there is sometimes, in the lungs,

(*c*) Sect. hac 2. Sepulch. Obs. 4.

(*d*) Ibid. Obs. 9.

(*e*) Epist. 28. n. 9, & 10.

(*f*) Epist. 15. n. 13. & seqq.

(*g*) Mem. de l'Acad. R. des Sc. A. 1712.

(*h*) Vid. Epist. 15. n. 3.

a peccant matter, and that in great quantity, which may be expell'd; but there is no cough, by reason of the sensation, in the internal coat of the bronchia, being dull, and deficient: to which, perhaps, relate two observations in the Sepulchretum, I mean the twenty-fifth, and twenty-seventh, of the first section of this second book. But on the other hand, sometimes the lungs are beset with matter, which cannot be discharg'd by the most violent cough, as, for instance, in the twelfth observation of this third section, or that which I have describ'd in another letter (*i*), of tophaceous lungs.

Nor ought you to believe otherwise, of the causes of a cough, which the cough itself is able, or not able, to discharge, from the upper air-passage, or elsewhere: although it is almost impossible for the cough to discharge those causes, which lie on the out-side of the air-passages, whether they are seated within the thorax, as when in the dropsy of this cavity (*k*), a cough is sometimes excited, but such as I have said is fruitless, or at least brings out none of that water, or whether they are situated on the outside of the thorax. For they are sometimes seated in the head, the neck, and the belly, as I have already said, instances of which I shall give you separately.

54. And first, that the cause of the cough may be in the head, is manifest to all, even from this circumstance, that a cough frequently follows the slight irritation which is occasion'd by picking the ears; whether the irritation be propagated through the internal membranes of the ear, and the eustachian tube, and, finally, through the tube of the pharynx, quite into the larynx; or whether it is the occasion of something being immediately discharg'd, from that tube, into the pharynx, which will stimulate this, and the larynx; or, at length, whether it draw some certain nerves into consent, as, for instance, those which go to the membranes, that are in near continuity with the internal coat of the larynx. And, as I have already said, the exciting of a cough of this kind is well known to every body. But to anatomists, that also is known, which depends upon an irritation, at the beginnings of the nerves, as sometimes happens in hydrocephali. You may read in the foregoing book of the Sepulchretum (*l*), the observation of Velalius relating to that disease; and you will find, that upon the slightest motion of the head, a violent cough was immediately excited, when no disorder was spoken of in the lungs. So also, in the observation of Lechelius (*m*), you will read of a cough, whereas no other viscus but the brain was disorder'd, and even the lungs in particular, were in a very natural, and sound state, and are said to be without any fault whatever.

55. But nobody is ignorant, that the causes of coughs frequently lie in the neck, that is to say, in the aspera arteria; but especially in the larynx, and that these may, sometimes, be discharg'd, even without the assistance of medicines, when the larynx is so vitiated, as, after a cough of a year's continuance, and the spitting of various kinds of matter, is describ'd by the celebrated Fantonus (*n*). And Lancisi, in a letter which he wrote to me, told me, that when Malpighi, and he, were conversing together, of certain very

(*i*) Epist. 15. n. 21.

(*k*) Epist. 16.

(*l*) 1 Sect. 16. obs. 6.

(*m*) Ibid. in Additam. obs. 4.

(*n*) De Observat. Med. & Anat. epist. 8. n. 8.

violent coughs, which others improperly ascrib'd to the class of convulsive coughs, it seem'd to them, that they should rather be number'd among those which have their origin from a small quantity of humour, but, in its nature, salt and acrid, such as those patients expectorated, and was preternaturally secreted from the glands of the larynx: in the number of which glands he afterwards would have reckon'd our arytenoidæ, and that so much the more readily, because he had found them, in a body he had dissected, "some-
" what monstrous in their size." And I call them mine, not only because this very learned man himself, first attributed them to me (o), but because it has never seem'd to me, as it did lately to a gentleman, in other respects very learned, that these glands had been before pointed out by Carpus, and Schelhammer. Do not take it ill, I beseech you, if I examine into this affair a little more deeply; for it ought to be done the more carefully, in proportion as we both of us owe the more to the authority of an illustrious man.

"Carpus had asserted," says he, "page three hundred and ninety three, that a glandular flesh was seated on the glottis. And Schelhammer had added, l. c. p. 11. that a glandular substance lay upon the arytenoid." And I would have you turn to both of these authors: I myself will readily point out the passages to you, that you may not have the trouble of looking backwards and forwards through many pages, and that you may not happen, by this means, to light on another opusculum of Schelhammer, which is less relative to this subject. You must turn to that dissertation of his, entitl'd, *De Voce*, in the first part of which, and chapter the third, speaking of the arytenoid cartilages, he says, "These are the support of a peculiar kind of substance, which is found no-where else in the body, and which Galen has aptly express'd, by calling it an adipose, cartilaginous, and membranous substance:" and having interpos'd some things relative to this substance, that he may shew it to be similar to those substances which Galen has mention'd, and to be in a kind of middle state betwixt the three, he immediately concludes thus, in the eleventh page, which is pointed out: "This substance, then, adheres to the double arytenoid cartilage, like a double crist, soft, lax, and smooth, more distant from each other when we breathe, and approaching mutually to each other when we speak, and when we hold in our breath, entirely shut up. The space, which is intermediate to both of these substances, is sometimes call'd the *rimula vocalis*, or *glottis*. Interpreters have translated it *lingula Galeni*." Does he say, then, "that a glandular substance is plac'd upon the arytenoid cartilage?" It cannot be suppos'd so in the least, since he says, that it is a substance of such a kind, as "is to be found no where else in the body," and confirms it also in the end of the fifth chapter (p). Let us, therefore, leave to Schelhammer "these crists, spines, or eminences, of the arytenoid cartilages," for so he calls them in another place (q), from whencesoever he has taken his idea thereof, and the glottis, which is no where sufficiently explain'd, in whatsoever manner he has understood it to be form'd; for he "suppos'd that the arytenoidæus proprius muscle, as it is call'd, was the substance of the glottis itself (r)."

(o) De Subit. Mort. edit. Venet. l. 1. c. 18.
ad n. 3.

(p) Part. I.

(q) Ibid. c. 4.

(r) Ibid. c. 3.

For it is sufficient with me, that it plainly enough appears, that "glandular substance" was not "added" by him.

56. Nor will you be less clearly convinc'd, in my opinion, that when it is said by Carpus, "that a glandular flesh is situated upon the glottis," he meant nothing else at all, than that the epiglottis had its own proper gland situated upon it; as I formerly admonish'd in those very first Adversaria (s). For the words of Carpus, which you have in his "Commentaries upon the anatomy of Mundinus (t)," and which are on the posterior surface of page three hundred and ninety-three, that is, of the page refer'd to, are in fact these: "Nature has ordain'd, as will be seen below, a certain glandular flesh, above or below the lingua, or tongue, which adheres to that air-pipe, in order to mollify the epiglottis, or larynx." But that "lingua," or tongue, "of the pipe," is not, with Carpus, what, with the interpreters of Galen, is the *lingula*, or rima, of the glottis, as I have mention'd just now, in the words of Schelhammer. For this *lingula* is entirely the same with that, which Celsus (u), who is quoted by Carpus, in the preceding page, had thus describ'd: "There is a very small part in the aspera arteria, which has the shape of a little tongue, lying immediately under the fauces: and this, when we breathe, is lifted up; and when we take down meat and drink, it shuts up the aspera arteria." That is to say, it is the cartilage call'd epiglottis, as Carpus shews in that very same page three hundred and ninety-three, and a few lines before, where he says, "Yet the proper epiglottis, by the force of the word, signifies epiglottida, which is the tongue of a pipe, plac'd upon the cimbalar cartilage." And this he not only confirms in several places, in the whole remainder of that twentieth commentary, but he there, above all, plainly declares it, where (x) he describes the epiglottis, properly so call'd, "by the figure of a human tongue, or of the tongue of a pipe," made by art, and in such a situation, that "with its most acute part, it goes toward the œsophagus, and shuts up the upper part of the cimbalar cartilage," that is the arytenoid; in the description of which, having soon after shewn that it was double, he has thus pointed out the separate cartilages of the larynx (y): "Besides these two cimbalar cartilages, there are three others, to wit, the clipealis, or shield-like cartilage, and a cartilage that has no name, and the cartilage call'd the tongue of the pipe:" which being added, he immediately concludes, that the cartilages of the larynx are five in number, instead of three, which others had suppos'd before.

But notwithstanding these things are so clear, that nothing can be more evident, yet, moreover, add this. Carpus had said, as I related a little above, "that he should enquire below" into that glandular flesh plac'd upon the tongue of the pipe, and its use. Where, then, is this done? In no other place, but where, in describing the epiglottis, properly so call'd (z), he has acknowledg'd "a fat flesh in it," the uses of which were, as he supposes, "to moisten the epiglottis," that is, the larynx, and epiglottis properly so call'd. And as even that very learn'd man has, a little below,

(s) N. 3. (t) Comm. 29.
(u) De Medic. l. 4. c. 1.

(x) Pag. 396.
(z) Pag. 396.

(y) Pag. 397.

rightly understood this passage of the gland of the epiglottis, although he thought that the former related to the arytenoid glands; so when he shall observe, that this other passage is to be refer'd to that first, I do not doubt, but, according to his known ingenuity, he will now say, that the arytenoid glands are rather to be sought for among other antient authors, than in Carpus, if any footsteps of them did really exist: and yet not in Galen, or Fabricius, although they "had said formerly, that the glottis was viscous;" the former, in his treatise *De Utilit. Part. l. vii. c. 13.* and the latter, *l. c. 9.* that is, *De Larynge, parte i. cap. 9.* for these are indeed "obscure traces." But if you should suppose, that what Galen has written in the same book, in the eleventh chapter, and Fabricius in the second, relate more to the present subject, you might at least produce the words of the first, which expressly affirm, that the body of the glottis "is membranous, adipose, and "glandular," and the words of Fabricius, which affirm nearly the same thing in hogs. For he says, that Galen had affirm'd this, "because he exactly describ'd the glottis of pigs, which is adipose, the adeps, however, "being very hard, and dense, so as to resemble even the substance of a "gland." But how far there are arytenoid glands in pigs, and where they are situated, 'tis not a place to enquire here, nor yet whether Galen meant to point them out. Fabricius, however, affirms, at least, "that most other "animals are, generally, destitute of that adipose, and glandular," body, which he acknowledges in a sow; nor finally, does he hint, that in any of them it is situated in that part, where the human arytenoid glands are situated, but quite more anteriorly, and inferiorly, as you will readily perceive, by reading that part of the chapter quoted, where he describes the glottis.

And whether these things are said for my own sake, or rather for the sake of a truth, which we both of us study to illustrate, in the history of anatomy, let this truly learn'd man himself, whom I very highly esteem on the score of his great merits, be the judge.

§7. Now let us return to the situations of the causes of coughs. For there remain'd of these, those which lie in the belly. And they are the most obvious, which lie nearest to the diaphragm, especially in the liver, and the stomach; for you will find, that causes of this disorder have been observ'd in the pancreas also, and partly in the spleen, and indeed in the kidneys likewise, in the Sepulchretum (a). For whether the septum transversum is irritated by mere contact itself, or the peritonæum, which you know is common to those viscera, and to the lower surface of the septum, is distracted, and hurt; or finally, whether the lungs themselves are drawn into consent, by the nerves being affected, which go both to those viscera, and to the lungs, coughs, that are in themselves dry and fruitless, follow affections of the same viscera. The last of this kind of causes seems to be chiefly applicable to the stomach, from the inspection of those nerves, just now spoken of, that go to this viscus, which is the first of all of the viscera of the belly, in a very great quantity; although there may be some who believe that the irritation is propagated from the stomach, through the œsophagus, either to the adhering trunk of the aspera arteria, or to the larynx itself also; into

(a) Sect. hac 3. l. 2. obs. 27. § 7. obs. 22. § 2. obs. 30.

which,

which, the internal membrane of the œsophagus is, at length, continu'd. However this is, I will give you an instance of a dry cough arising, according to appearances, from a tumour annex'd to the stomach: and then I will immediately put an end to this very long letter.

58. An old woman of seventy, who had formerly been a drunken nurse, and always coveted wine, had been render'd, for at least eighteen months, unfit for service, by reason of the following indispositions in her health, and chiefly a cough which was dry, a difficulty of breathing, and a continual pain in the head, although sometimes encreasing, and sometimes remitting, together with the natural consequences of these complaints, watchings, and loss of appetite, to a great degree. These things I learn'd from the women who liv'd with her, when, on account of some things, which were found in her body, I took care that other circumstances should be enquir'd into, but particularly, whether she complain'd of any hardness in the belly, swelling, or sense of weight; which they affirm'd she did not. At length, after having labour'd under a kind of peripneumony, for a few days, she died.

Her body was emaciated; which made the globe of fat, that was found under the skin to the bigness of a fist, upon the ensiform cartilage, so much the more remarkable (*b*). The belly being open'd, nothing appear'd more worthy of observation, than a roundish tumour of the weight of a pound at least, which was annex'd to the posterior surface of the stomach, at about the middle of it. This tumour was externally unequal, with little, and perfectly hemispherical, tubercles upon it, and internally variegated with a white and brownish colour, and also with a blood-colour, from the tincture of the vessels. And although it was every where so hard, that you would not have hesitated to take it for a schirrhus; it was internally, in some parts, endow'd with a bony hardness. Being cut asunder in two parts, the sections were equal to three inches breadth, in one diameter, and four in another diameter. It had no communication with the cavity of the stomach: and when this cavity was open'd, it appear'd rugous, and just as it does in healthy persons, even in that part which answer'd to the tumour, that is, to the space of about two inches. And, indeed, the coats which cover'd the internal coat to that space, were found, and not annex'd to the tumour: which was tied to the stomach only by the external coat. This seem'd to be produc'd over the tumour, and make the external surface of it, and carry with it its sanguiferous vessels, one of which, in appearance venous, proceeding from the tumour, crept through the inferior surface of the stomach, being almost equal in thickness to a goose-quill. It was very easy to conjecture, that any the least gland of the class of the conglobated glands, adhering to the external coat, or the cellular membrane, which lay under it, or even some cells of the cellular membrane, if you choose rather to suppose so, had grown out into this great bulk, the matter being, by degrees, collected, and drawing these coats from the others by its weight. The spleen, however, being somewhat larger than was natural, and internally pale, was of such a laxity, that it seem'd rather to contain a kind of pulice, than what it is wont to contain. The liver was very long transversely; in its internal substance palish, and almost variegated, but not hard. The great artery was in a manner winding,

(*b*) Vid. Epist. 50. n. 24.

and the iliac still more, inasmuch as they seem'd, in some places, almost to swell out into diverticula, or little reservoirs. The internal surface of the one, and of the others, was, here and there, white, and cover'd with bony scales, which were small however, and only in few places. These were the appearances in the belly. In the thorax, and head, I could not make use of equal diligence, being taken up with the public anatomy of the year 1745, for which the other bodies that I was supply'd with, were less unfit, as the muscles of this body were very lax. This, however, I know, that the heart was not affected with any disease, which was obvious: and that the lungs were annex'd to the pleura, and hardish, but had no appearance that shew'd a true inflammation, and still less any that shew'd an inveterate disease. However, of what nature that true inflammation is, which occurs in the lungs, the next letters will demonstrate. Farewel.

LETTER the TWENTIETH

Treats of pain in the Breast, Sides, and Back.

THERE are so many observations both of Valsalva's and of mine, relative to pains of the breast, sides, and back, but especially of the breast, that although I have sent some of them to you, in other letters (*), to which also they related, and am to send others hereafter, I am, nevertheless, under a necessity of dividing the remaining observations into two letters, the first of which contains those of Valsalva, and the other mine.

2. He saw, then, a carman, about forty years of age, who, although he had been troubl'd, for a whole year, with fevers, and even at last with a peripneumony also, with a dry cough, and a difficult respiration, attended with some slight delirious symptoms, yet never would go to bed, but went about his ordinary business, in whatever manner it was. Wherefore he did not come to the hospital, till the fifth, or sixth day from the beginning of the peripneumony, and then came by himself, and on foot: where being extremely troubl'd with the same symptoms, he died within twenty-four hours.

In the belly was found a small quantity of limpid serum: and the spleen was three times as large as is natural. In the right cavity of the thorax were some ounces of turbid serum: and the superior lobe of the lungs, especially towards the back, was entirely inflam'd; and this being cut into, very small abscesses, containing a sanious matter, were every where found. The pleura was unhurt. The cavity of the pericardium was half full of its own natural fluid. In the heart were polypous concretions, being greater in the auricles

(*) VI. n. 10, 12, 14. VII. 4. XXII. 10, 16, 22. XXXVI. 23. XXXVII. 29. XLV. 16. XLVIII. 32. LII. 15.

and less in the ventricles at the mouths of the arteries, and out of these last mention'd, those were the greatest, which were in the right ventricle.

3. A man of forty years of age, who had long been in the hospital of St. Mary de Vita, at Bologna, in order to be cur'd of a slight wound in his leg, and had lain near another man, who had been, at length, taken off by a large abscess of his leg, was seiz'd with a cough, and an acute fever; the matter he spat up was ting'd with blood, and afterwards inclin'd to a green colour, with a difficult respiration, and a pain in the right side: and while these symptoms were violent, and he lay on his right side, on which he could lie easily, he died, about the fourth day from the beginning of the acute disease.

The left lobe of the lungs was found, and unconnected. The upper lobe of the right lobe, and the upper part of the next lobule, both of them on that side, towards the back, were turgid with an inflam'd, and very hard tumour, and closely adher'd to the pleura by membranous connexions. Yet the pleura bore not the least mark of inflammation. Each ventricle of the heart contain'd a single polypous concretion, which was of a large size: yet the right contain'd the largest: and although they were produc'd not only into the auricles, and veins, but into the arteries also, yet they were less produc'd into the arteries, than the veins.

4. Both of these histories teach something of themselves, which is known indeed to every body, but never sufficiently inculcated: the first, that unless we endeavour to overcome great disorders in time, even the strongest men, and for that reason trusting too much in themselves, among whom that carman certainly was, are carry'd off more hastily than we should imagine: the second, that those persons are very careless of themselves, who lie long in hospitals, on the score of slight disorders, especially if they lie near patients, who infect the air with unwholesome vapours: for they are, by this means, dispos'd to much more violent disorders, than that was, which they went thither to get rid of, as happen'd to this very man, who, by this means, was seiz'd with a most acute inflammation, and that of a malignant kind, if you attend to Fantonus (*a*), who pronounc'd that the cause of an inflammation of this kind, consisted in a thin and greenish humour, which colour was observ'd in the matter expectorated by the patient in question. But as to the pain, the cause, and seat thereof, I shall have a better opportunity of writing on these subjects below. In the mean while, do not wonder, that Valsalva mention'd no pain in the first history. For when he spoke of a peripneumony, he understood a dull heavy pain, just as he did a fever, though he expressly asserted neither. I am not ignorant, however, that in this disorder, the pain sometimes seems to be nothing, as I shall shew on a future occasion (*b*), and the fever but slight (*c*). Yet when this circumstance does happen, it ought not to be omitted; nay, it ought to be diligently remark'd, which Valsalva would certainly have done. But now he omits to mention the fever in more than one history (*d*), being a thing which may be easily sub-understood, as particularly in the two which I shall immediately subjoin.

5. An old man, who was sixty-five years of age, having been seiz'd two years before with a palsy of the right arm, and being freed therefrom, was

(*a*) in hac l. 2. Sepulchr. sect. 4. obs. 28.

(*b*) Epiit. 21. n. 5. & seqq.

(*c*) Vid. infra, n. 26.

(*d*) Vid. infra, n. 20.

accustom'd to complain frequently, afterwards, of a pain in his head, and was, last of all, receiv'd into the hospital, which I mention'd above, for an inflammation of the lungs, where he was much troubl'd with a pain, and sense of weight, in the left part of his chest, and expectorated a purulent matter: but this discharge being deficient for many hours, he died suddenly, which was about the twenty-third day.

The left lobe of the lungs was entirely tumid, and hard, and fill'd up the whole cavity, containing an ulcer, which abounded with much sanies, that was diffus'd even through the greater part of the lungs, on that side. But the pleura was altogether sound. The right side of the heart contain'd a polypous concretion, which extending itself through the vena cava, as it were, to the length of a cubit, imitated its various partitions. There was another in the left side of the heart; but this scarcely reach'd to the great artery. In the ventricles of the brain was found water, to the quantity of half a pint: nor was there any other preternatural appearance in the whole brain, if you except the glandules of the plexus choroides, which were very turgid.

6. Nothing more accelerates death, in disorders of this kind, than a suppression of the matter that ought to be expectorated. And this so much the more easily happens, as the strength, by reason of long-continu'd sickness, age, and a taint of the nervous kind, is proportionably decreas'd: all which, you see, were join'd together in the old man here spoken of. But as to that which was seen in his brain, it may point out to you, what was the cause of the palsy which had preceded, and of the pain which often affected the head, if you turn back to what I have before (e) written to you in regard to both these affections.

7. A woman, about twenty-seven years of age, who, though she had been married four years before, had never conceiv'd, was affected with a pain in the left side of the chest, with a difficulty of breathing, and a violent cough, by which she had some expectoration. She died. Upon opening the thorax, not only serum was found in its left cavity, ting'd with a white colour, but the lungs also were inflam'd on the posterior part: from the section of which, although no abscess appear'd, a sanies mingl'd with blood flow'd out, and black spots were seen here and there through its substance. The belly being open'd, in the ovaria, the fluid of the vesicles was found to be wholly concreted, just as if it had been boil'd over the fire: from which, it is probable, that the cause of barrenness had arisen.

8. This you will also add to the other causes of barrenness. But as it is not a proper occasion to speak of this here, we will pass on to the history of another woman, who had often conceiv'd, and who, when the approach'd near to the time of her delivery, was taken off by an inflammation of the lungs.

9. A noble matron, aged five and-forty, of a very fat habit of body, and abounding with serum, in whom, when in health, respiration was always somewhat difficult, especially after motion, and a slight cough and frequent spitting very often return'd, and who had almost every day, after a disturb'd and restless night, vomitings of thick and viscid matter in the morning, by

which she seem'd to be reliev'd, having already brought forth many children, and having suffer'd many miscarriages also, when, at length, in the year 1689, she had enter'd upon the ninth month of her pregnancy, and had long expos'd herself to a very cold air, was seiz'd with a great rigor in her whole body, which was follow'd by an equal heat, attended with violent thirst, and difficulty of breathing, a very troublesome cough, an oppressive pain in the right part of the thorax, verging to the scapula, a quick and hard pulse, a bilious vomiting, (from which there seem'd to be some alleviation) and with that inquietude and tossing of the whole body, which was very troublesome, even on the following days. A vein was open'd in the right arm; nor were the other assistances of art omitted. Nevertheless, a more vehement attack of the disease coming on, to those first disorders of the pulse, an intermission also was added on the second day, and a necessity of breathing with the neck erect, together with a discharge of watry and livid matter by spitting, and of a bilious matter by stool.

On the third day, the difficulty of breathing was increas'd, and a stertor came on: the expectorated matter was less in quantity, very thick, dense, and whitish, and sometimes also yellow: she had a considerable number of stools: her pulse was still more unequal. Blood was again taken away, and other remedies made use of, but in vain.

For on the fourth day all the symptoms became worse: and that pain of the chest, which, as I have said, had been of a heavy kind, began now to be very pungent and acute, especially when the patient cough'd, or mov'd her body: and to this was afterwards added a pain in the lower part of the belly, not much unlike the other, which caus'd some suspicion of delivery coming on. But on the following night, amidst frequent inequalities, and intermissions, the pulse began to faulter, and the pains being alleviated, the continual tossing of the whole body being remitted, the spitting being suppress'd, and the strength being wearied out, the beginning of the fifth day put an end to her life.

The abdomen being immediately open'd, the uterus was somewhat inflam'd, and a female child was found to be already dead therein; yet the viscera of the child, as well as the remainder of those in the belly of the mother, were in a natural state. But when the thorax of the mother was laid open, the right lobe of the lungs shew'd a very great inflammation, and hardness, and an abscess already begun under them.

10. Although you will, perhaps, wish at first, that Valsalva had describ'd the anatomy of the thorax of this matron, with the same accuracy that he did the disease; yet neither the hardness of the pulse, nor the pain which from a heavy one became pungent, necessarily indicate, that besides an inflammation of the lungs, which he has mention'd, there was also an inflammation of the pleura, of which he makes no mention.

But as I shall have occasion to speak of both these signs again below, when I speak, once more, in behalf of the same opinion (*f*), I shall speak but slightly here of each. For that the pulse has been hard in those who were affected with a peripneumony, and yet the pleura has been found with-

out any inflammation, you will see hereafter (*g*): nor did Galen, on whose authority they chiefly depend, who deny that the pulse is hard in a peripneumony, deny this himself (*b*); but even confess'd expressly, as Schneider has admonish'd us (*i*), that this does happen "now and then," and abounds with bilious matter, as in the case before us. Nor is it to be wonder'd at, if in so great an inflammation of the lungs which this matron labour'd under, its external membrane was, at length, also inflam'd: and when this happens, Schneider (*k*), whom I have already commended, did not doubt, but by reason of the small nerves which go into this membrane, the pain might become pungent, which was afterwards confirm'd by Vieussens (*l*), who asserts, "that a great number of nervous fibrillæ terminate there." Nor had Sannertus (*m*) doubted upon this point before; nor did the author of the scholium which is added to the observation, in this fourth section of the Sepulchretum (*n*), doubt afterwards, (which passage is wrongly pointed out by Tulpus) especially if "either the tension be strong, or the inflammation great," as in this matron.

See how many circumstances conspir'd to the death of this matron, and of what kind they were. In the first place, she was very fat: which shews the cause of the disorder to have been very violent; for bodies of a fat habit are less liable than others, to pleurifies and peripneumonies, as is observ'd by that equally learn'd and diligent physician, Triller (*o*): which, upon calling to mind all the pleuritic, or peripneumonic patients, that I have seen, or taken care of, I find to be true; and you may easily perceive the same, from reading all the histories of those, who have been dissected by Valsalva, and, in like manner, by me, this, and another of Valsalva's (*p*), excepted.

Besides, it is sufficiently manifest, how much room is taken up by too great a quantity of fat; so that the lungs, especially in a recumbent posture, are much press'd up, and confin'd, by which respiration and expectoration are render'd much more difficult. To these was added the great distension of the uterus, which in the ninth month is very considerable. Nor was an inflammation of the uterus entirely wanting, which I suppose began at the time, when the pungent pain in the lower part of the belly brought on a false suspicion of the delivery being at hand.

But you will easily understand, how much even the utero-gestation itself, when a peripneumony comes on, makes the disorder more dangerous, whether you consider the symptoms of the disease, or the principal remedies that are apply'd: for there are, I say, on one hand, frequent concussions of the cough; pain, and watching; and on the other, blood-lettings, together with a slender diet; whereas we must neither take from the fœtus what serves to its nourishment, nor yet suffer the strength of the child, or the mother, to be so pull'd down, as not to be sufficient for delivery, especially when the birth is at hand, as in the present case. Yet, nevertheless, the opinion of

(*g*) Epist. 21. n. 16, & seq.

(*b*) De Caus. Puls. l. 4. c. 12.

(*i*) Dissert. de Peripneumonia, c. 2. § 26.

(*k*) Ibid. c. 1. § 10.

(*l*) Neurogr. l. 3. c. 4.

(*m*) Medic. Pract. l. 2. P. 2. c. 3.

(*n*) 20. § 3.

(*o*) Vid. Commerc. Litter. A. 1741. Hebd. 2. n. 2. ad Aph. 14.

(*p*) Infra, n. 61.

Hippocrates (g), "That an acute disorder, when it seizes on a pregnant woman, becomes mortal," is not to be taken in any other sense than as Celsus translates it (r), *acuto morbo facile consumi*, "that a pregnant woman is easily destroy'd by an acute disease;" for he has not always put *facile* for *certe*, by which it would be understood, "that a pregnant woman is certainly destroy'd by an acute disease;" or if he did use it there in this sense, he had an eye to those ancient methods of cure, which were intolerable to pregnant women: for it has since, by the blessing of God, happen'd to me, and to many others who practise physic, nor yet so seldom as some think, that, by means of a diet moderately thin, and by making use even of blood-letting, sometimes, cautiously, where the case requir'd it, the mother and the child have been sav'd both together, even more than once in a disorder like an angina, as in Jacoba Severia, manifestly join'd with an internal inflammation of the thorax: yet these patients were not fat, nor had weak and lax lungs, like the matron we speak of. For as she had been long subject to a cough, and frequent expectorations, she was, without doubt, so dispos'd to a peripneumony, that she could not be equal to the overwhelming force of it; nor was it of the light kinds of disorder, as an ancient author says, or if you chuse rather, as Hippocrates says (s), of the kind "of those that are not pernicious and soft," since it had not "a few," but a great number "of those signs," which the same author enumerates. For there was "an acute fever, a frequent and warm breath, an anxiety, and tossing, a pain under the scapulas, a heaviness in the breast, and a violent cough;" and besides these, others still, as for instance, the necessity of breathing with the neck upright, a great thirst, great disorders of the pulse, livid spittings, the belly frequently loose, more frequently, I believe, and more plentifully, than it ought to have been; so that "the humour being secreted below;" as the same Hippocrates says (t), "the purgation by spitting was not carried on above;" and indeed this discharge was from thence made less in its quantity, and very thick. For which reason, he pronounc'd in another place (u), "that a diarrhoea coming on after a pleurisy, or inflammation of the lungs, was bad." It does not escape me, what physicians have seen to the contrary, and that not very seldom, and what exceptions they make for this reason, at the same time that they commend some of the observations and opinions of Hippocrates himself. Nevertheless, a diarrhoea is, for the most part, noxious, in disorders of this kind, unless it should be accidentally proper on the first days, or critically succeed, in the progress. And this so far, that I can mention two men of illustrious birth, who were my fellow-citizens, not to speak of many others, who were instances of this doctrine: I mean, the Marquis Thomas Augustini, a nephew of Stephen, of the same name, who was a cardinal of the holy Roman church, and Count John Gaudio, the one at that time aged sixty-five years, and the other older by eight years. In the first, indeed, when seiz'd with a peripneumony, I observ'd that a diarrhoea was very useful in the end of the disease, and gave the finishing

(g) Sect. 5. Aph. 30.

(r) De Medic. 1. 2. c. 6.

(s) De Morbis. 1. 3. n. 16.

(t) Ibid. n. 17.

(u) Sect. 6. Aph. 16.

hand to the cure : but in the other, who was seiz'd with the same disease, the same flux coming on about the third day, at first render'd the expectorated matter little in quantity, tough, and, in a manner, dry, but afterwards destroy'd the strength, and wholly suppress'd the spitting ; so that having endeavour'd in vain to moderate the diarrhœa, and to preserve the discharge from the lungs, I could scarcely succeed so far, that his life should be prolong'd even to the ninth day. And that the same happen'd to a virgin, eighteen years younger than this nobleman, you will learn from the next history of Valsalva.

11. A virgin, about fifty-five years of age, was seiz'd with a pain in the thorax, especially about the sternum ; she had also a fever, a pain in the head, and a difficult breathing, and expectorated a great quantity of matter. A diarrhœa coming on, all the symptoms became more violent, and the difficulty of breathing so great, that she could not breathe but with her neck erect : she died about the ninth day.

In the abdomen the gall-bladder was observ'd to be turgid with bile, and both the ovaries to be much indurated. The thorax being open'd, the left lobe of the lungs was found to adhere so much to the pleura, wherever it invests the ribs, that it could not be separated without laceration. But the right lobe, adhering closely to the whole mediastinum, and in like manner to the pleura, where it invests the upper ribs, was, by reason of its rottenness, torn into pieces, by attempting to separate it from the pleura with the hand, and at the same time, it discharg'd from an abscess which it contain'd, a great quantity of sanious matter, of a palish red colour. The pericardium was full of serum. In the right ventricle of the heart was a large polypous concretion, which particularly occupied the neighbouring auricle, and was produc'd through the orifices of the communicating veins. There was none in the left ventricle ; and only a slight beginning of one in the entrance of the aorta, and pulmonary vein. But the blood in this body had lost its fluidity.

12. The other circumstances, which you have read in this observation, will be spoken of on a more convenient occasion. It is proper here, to attend to this one in particular, that as the pain was principally about the sternum, the lungs adher'd closely to the whole mediastinum, which is connect'd with the sternum. But it is connect'd also, you will say, to the vertebræ of the thorax, about which parts no pain is spoken of. I grant it you : but you must in return grant me this, that, in a violent respiration, which this virgin was under a necessity of using, the sternum is mov'd, and not the vertebræ ; for which reason, those parts of the mediastinum were more affected, that are annex'd to the sternum. But be this as it will, if you will read the second observation, in this fourth section of the Sepulchretum (x), and the scholium, not only that is subjoin'd to it, but also that which is, by mistake, subjoin'd to the third observation, as it ought to have been plac'd under the second, and in like manner, the twenty-ninth observation ; you will immediately observe, that when there was an inflammation in the mediastinum itself, or in the pericardium, which you know is annex'd to it, and, in a manner, part of it, the sense of pain and uneasiness was not perceiv'd about the

vertebræ, but about the sternum. And to these things which I have been saying, the next history may in part also be referr'd.

13. A butcher, about fifty years of age, was seiz'd with a pain in the right side of his thorax, and even in the middle of his sternum; he lay on his back, he cough'd very much, and spat up but little. He was forc'd to breathe with his neck upright. At length he died on the seventh day.

The right lobe of the lungs had grown hard, in its whole upper part, and adher'd a little to the sternum, but much more closely to the mediastinum. The left lobe was ting'd, on the posterior part, with a black colour. On the left side also, the thoracic cavity contain'd a little serum; with which the pericardium was full. In the right ventricle of the heart, was observ'd a polypous concretion. But the blood, in this body, was more inclin'd to fluidity, than concretion.

14. In disorders of this kind, the blood generally verges to concretion; and from this tendency they generally account for polypi, that is, polypous concretions, which you will find are generally observ'd in Valsalva's dissections of peripneumonic patients, and mine. Though, indeed, the matter sometimes proceeds so far, that the blood loses its fluidity, which was observ'd in the body of the virgin spoken of above (y). But in the living body, it frequently happens, when the inflammation is very dangerous, that the blood approaches so near to concretion, that a vein being open'd, it scarcely comes out from a large orifice, and drips down very slowly: and this I remember was the case in many others, but particularly in Maria Varania, who was taken off by an insuperable peripneumony, every artifice to make the blood flow out, being applied in vain. But on the other hand, it sometimes happens, that the blood, in peripneumonic patients, tends to a fluid state, whether there be any polypous concretion, as in the butcher in question, or none, as in the three observations that follow. The first of these is so much the more rare, as children, and especially those that are newly-born, are said to be less liable than others, to disorders of this kind, by Aretæus (z), which is also confirm'd by the celebrated Triller (a).

15. A young girl, fourteen days old, was affected with a stertor, and a redness of the face: she refus'd to suck the breast, so that it was necessary to make use of art, in order to give her that nourishment. These symptoms continuing eight days, she died. The lungs were inflam'd, and particularly on the back-part, and were distinguish'd with some black spots in their substance. In the stomach was a great quantity of bile. But in the vessels, the blood preserv'd its natural fluidity.

16. A virgin of twenty years of age, was first seiz'd with a pain in the left side of the thorax, and after that in the right. She could not lie on the right side; she cough'd: she was delirious in the night: she was so far affected with convulsions, that some of her limbs remain'd drawn up. At length she died. The right lobe of the lungs was somewhat inflam'd, especially on the posterior part. And the left lobe, which adher'd every where closely to the pleura that invest'd the ribs, and diaphragm, so that it could not be taken away without laceration, was extremely red. In the heart was no polypous

(y) n. 11.

(z) De causis Acut.morb. l. 1. c. 10. in fin.

(a) loco supra ad n. 10. indic. Aph. 16.

concretion : only in both the ventricles, the blood was black, and coagulated. It was also black in the vessels, and very thick ; but still fluid. The head, likewise, and the belly were open'd. In the former, the brain was very found : only there was a little serum at its basis. But in the belly, which before dissection had been observ'd to be somewhat tumid, the cause of this circumstance was found to be, that the colon was very much distended with air. In other respects, the colon itself, and all the other viscera were found : although that intestine, when it came to the stomach, immediately bent its course downwards, below the middle of the belly, and was reflected from thence immediately, to the upper part of that cavity, and then continu'd in its natural course. But the appendicula vermiformis was equal in thickness to a goose-quill, and in length to about eight fingers breadth, being obliquely stretch'd out towards the kidney.

17. A young man, almost thirty years of age, after a long course of labour, was seiz'd with a small, and obtuse pain, in the left part of his thorax ; he was feverish, and breath'd with difficulty, but expectorated nothing. These symptoms lasted even to the fourteenth day, in which time, the disorder seem'd to remit something. But on a sudden, a great difficulty of breathing came on, with a stertor, and a spitting of a frothy matter, of a rosy colour, which he threw up in great quantities, without a cough, and without any difficulty. Notwithstanding, through the whole course of this disease, he had lain on the right side, and sometimes also on the back, he died on the seventeenth day, while he was turning himself from his back to the right side.

The thorax being open'd, the pleura was found to be unhurt, and the lungs altogether free from it. But the left lobe was every where inflam'd, except at the superior part : from which, although found, the blood burst forth by drops, in two places ; so that more than four pounds of this fluid were found stagnating in the same left cavity of the thorax. In the heart were no polypous concretions.

18. In none of these three observations were there any polypous concretions, as you see. But if in a tender infant (*b*), in which early age they are very rarely said to be found (*c*), it is less to be wonder'd at ; and if in the virgin, the blood, although fluid (*d*), was nevertheless very thick and coagulated, in the ventricles of the heart ; at least none of these circumstances occur in the last history. And indeed, the effusion of blood into the left cavity of the thorax, in such a quantity, and its bursting forth even in the dead body, sufficiently shew its fluidity. But it seems, that so much the greater quantity of it had flow'd into the upper part of that lobe of the lungs, which was found, in proportion as less could be admitted into the lower part, that was entirely obstructed by inflammation : wherefore more and more blood still flowing, and the column pressing on from behind, it seems that the vessels were at length ruptur'd, some of the smallest of which would burst into the air-passages, and give that rosy colour to the expectorated matter ; and others, somewhat less slender, would burst on the external membrane of the lungs, from whence so great a quantity of blood in that cavity of the thorax : and whereas by rupture, and extravasation of blood into both these places, all the symptoms became more violent, it seems that death did then at length come on, after that

(*b*) n. 15.

(*c*) Vide tamen *Commerc. Litter. A.* 1744.

Hebd. 42. n. 1. ad art. 15.

(*d*) n. 16.

the sound part of the left lobe of the lungs, being render'd altogether incapable of respiration, from the blood being more and more extravasated, both on the inside, and on the outside of the surface, he turn'd himself on the right side, and by this means compress'd the only lobe of the lungs, with which he could breathe, by overwhelming it with the bloody humour, which must fall down from the left bronchia to the right, the mediastinum at the same time giving way, from the weight of blood, which was extravasated about the left lobe of the lungs, being added to the weight of the lobe itself, which was so much encreas'd by inflammation. For the right lobe could not bear up under so many oppressive circumstances at the same time, as it before bore only this one weight of the left lobe.

19. But perhaps there will be something which you will interrogate me upon, in regard to this last observation of the young man, and upon that other of the virgin (*e*). And first, why could the young man lie on his healthy side, whereas the virgin was forc'd rather to lie on the diseas'd side, in like manner as the man, whom I spoke of as having come into the hospital for a slight disease, and having perish'd of a violent one (*f*), could lie very easily on the diseas'd side?

It is very supposable, that the cause of the difference is to be taken from this circumstance, that in the young man the diseas'd lobe of the lungs was loose and free; but in the man, and the virgin, annex'd to the pleura, in such a manner, that if they attempted to lie on the sound side, the weight of the lungs immediately distracted the pleura, and created uneasiness.

The other circumstances relative to the virgin, are partly not altogether without the bounds of a natural constitution, as these, which are describ'd in the belly, partly belong to what I have treated of in other places, as what was met with in the head, and are partly very easy to be explain'd, as, for instance, an attack of the pain, first on the left side, and after that on the right. For as the matter which caus'd the inflammation, had first stagnated in that left lobe, which, as it was so closely connected to the pleura of the ribs, and diaphragm, was less able to dislodge it from thence, this matter continu'd to overload it; but the remaining part of the matter fell, in some measure, on the other lobe, that was loose, and brought on a slight inflammation there. And it is not at all to be wonder'd at, that the lobe which was first attack'd, had the much greater inflammation, either because it was weaker than the other naturally, or was render'd so by the attack of the disease: which happen'd, as you will see, in the following case likewise.

20. A priest of almost thirty years of age, was seiz'd with a difficult respiration, and spat up a great quantity of matter: in the beginning he complain'd of pain in the right part of the thorax, and after that in the left. He died on the tenth day. In both the cavities of the thorax was serum, but not a great quantity: a portion of which had concreted every where upon the lungs, like a palish coat. And the right lobe, in that part where it look'd towards the back, was extremely red: and had grown hard also; yet less so than it is wont to do in other peripneumonies: but about the middle a purulent matter began to be generated internally. The left lobe of the lungs, in like manner, shew'd a slight inflammation on the back part. The pericardium was thicker than it naturally is, and was turgid with a yellowish serum: and

from a concreted portion of this serum, a kind of reticular body, as it were, was form'd, both on the external surface of the heart, and the internal surface of the pericardium: which being press'd upon, some small drops of serum burst forth. The right ventricle of the heart contain'd a polypous concretion.

21. This history, where it describes the right lobe of the lungs, gives me an opportunity of subjoining another; and where it describes serum in the thorax and pericardium, it gives me an opportunity of subjoining many more.

To begin with the first, these words are to be attended to, that the lungs had indeed grown hard, but less than is usual in other peripneumonies. For most persons seem to suppose, that inflammation of the lungs consists, almost wholly, in redness: and that this may sometimes happen is not to be denied; as when, for instance, the inflammation happens to be of the true erysipetulous kind. But in most inflammations the lungs become hard and dense. Which, amongst others, after Coiterus, whose words I shall produce on another occasion (*g*), Guarinoni, as you have it in the Sepulchretum (*h*), formerly observ'd. His words are, "You will seldom find, in bodies which " have died of a pleurisy, that the lungs are not full and hard." And Wepfer, after having said of the lungs of a certain person, as you will read in the same place (*i*), "Yet that redness was not the index of a considerable " inflammation, for in that part the lungs continu'd soft;" went so far, as expressly to add this, "For the lungs, when inflam'd, are always found to " be harden'd." And the hardness and density are of such a nature, for the most part, that being then cut into, they seem to be any thing else, rather than the lungs (*k*). Thus to Valsalva, in many bodies, have they seem'd like very solid flesh: and this, in a certain writing of his, he thought might be accounted for, in a probable manner, from a vitriolic acid coagulating the blood in the pulmonary vesicles, since the flesh of the muscles also, is nothing else but white membranous filaments, which, as they retain the blood in their extremities, acquire the name of flesh. But however this might be, he affirm'd that he had certainly found it so, in the lungs of men, whom a peripneumony had taken off, within four or five days; so that we cannot doubt, in what manner he found them to be affected, in those whom I have describ'd (*l*), as being taken off within such a short time, by this disease. But although in the writing I have spoken of, he only endeavour'd to shew, that this might happen to the lungs, within a few days, it does not therefore follow, that he did not find the same thing in those who liv'd longer; and that he did really find this appearance, is not only obscurely shewn in several places, but expressly confirm'd by the following history.

22. An old man, about sixty years of age, was seiz'd with a pain in the right side of his thorax: he had a fever, he cough'd, he spat up matter, he lay most easily on his back. The quantity of expectorated matter became greater; but by opening a vein, on the tenth day, it was suppress'd.

(*g*) Epist. 21. n. 38.

(*h*) Sect. hac. 4. in Additam. Obs. 2.

(*i*) l. 4. S. 3. in Addit. Vid. Schol. ad Obs. 26. n. 8.

(*k*) Vid. Epist. 21. n. 20. 28.

(*l*) supra, n. 3. 9. & fortasse etiam 2.

Wherefore he died on the eleventh day. The left lobe of the lungs was found, although it adher'd on all sides to the pleura. On the contrary, the right lobe, although free from the pleura, was found to be greatly inflam'd towards the back-part, so as to resemble the more solid substance of flesh. Two very small separate polypous concretions, and in a manner equal one with another, were found in the separate ventricles of the heart.

23. This observation gives a handle, as it were, for adding many more, before I describe to you those which I promis'd you, on account of serum being found in the thorax, and pericardium. Let me omit to mention, as it is already mention'd above (*m*), that by no circumstance whatever is death accelerated more, in a peripneumony, than by the suppression of the spitting. And that this often happens from unseasonable blood-lettings, especially in old men, I also omit; although there are many physicians who kill their patients, for that reason, because they do not know when to be quiet. Amongst whom I formerly knew an elderly physician, who indeed by blood-lettings, repeated again and again, broke the violence of the peripneumony, but so took away the strength of the patient, that most of them, not being able to expectorate, were suffocated in the very decline of the disease; whereas another physician, in the same place, and the same constitution, who let blood indeed, but not beyond bounds, sav'd almost all his patients. And yet even old men, to whom the successful case of Marshal de Botzheim, who was more than ninety years of age (*n*), may give hope and courage; I say, even old men may have blood taken from them, and I myself have taken it, when the circumstances of the patient suffer'd it, and that even on two days successively, as in a very aged woman, to whom I had not been call'd till the fifth day of the peripneumony, Anna Mazonia by name, whose blood, together with the water into which it was discharg'd, for the blood was taken from the hand, coagulated into a perfect jelly: but I did not take away more, in those two days, than five ounces at a time, that is to say, as much as the strength of the patient permitted; and not only what the present strength permitted, but also what it was necessary to preserve, for the sake of continuing expectoration, by means of which the old woman happily recover'd, though the disorder was carried out so far as to the twenty-third day. But lest I should seem to do the contrary to what I have promis'd, let us pass by these things also, and have regard only to this circumstance, in the old man spoken of, that he lay very easily on his back.

The cause of this circumstance is not always so evident, as it seems in that case to be. For although the right lobe of the lungs, towards the back, was so inflam'd and heavy, yet as it was quite free from the pleura, it could neither cause any distraction of the parts, nor oppress the sound part of itself, or the other lobe, in that supine state of body. But how did it happen, that the butcher spoken of above (*o*), could lie on his back, though he had his lungs in a state of induration, and adhering to the sternum? Was it because, in the beginning, as seems consonant to reason, the lungs were less heavy, in consequence of not having collected together so great a quantity

(*m*) N. 6.(*n*) Vid. *Commerc. Litter. A.* 1744. Hebd. 3. n. 1.(*o*) N. 13.

of matter? And after this matter was increas'd, then, at length, could he no longer bear to lie on his back, but was oblig'd to draw his breath with his neck stretch'd out, as I have said. But what explanation shall we give of the case that follows?

24. A man, who was about forty years of age, and labour'd under two hernias, was seiz'd with a pain of the thorax, and a difficult respiration. In the beginning of the disease, indeed, he lay very easily on the right side, after that on the left; but on his back he could by no means lie. He spat up much matter. He was compell'd to breathe with his neck upright. On the tenth day he died.

Both lobes of the lungs adher'd to the pleura, yet so that they could be separated without laceration, and towards the back they were very much inflam'd, and very hard. There was no water in the pericardium. In the heart were three polypous concretions: one in the left ventricle; and two thicker and more firm concretions occupied the right ventricle, and the whole of its annex'd auricle. As to what relates to the hernias, circocele, and hydrocele; the latter was caus'd by serum filling the cavity of the tunica vaginalis, which, when compress'd, emitted some drops of an aqueous fluid; and the former, by a varicose production of the veins of the scrotum, which, not inelegantly, represented the figure of a chain.

25. Why this man should lie more easily on his right side, and after that on his left, and not at all on his back, is indeed difficult to be explain'd, if we have regard to nothing, but those appearances which were at length found in the body after death. But as these things happen'd in the beginning, and before he was oblig'd to breathe with his neck upright, reason requires that we should reconsider, in what state things might be, at that time, in the thorax. And nothing forbids us to suppose, that the collection of morbid matter was, at first, greatest in the right lobe of the lungs, and after that in the left, till being become equal on both sides, the man was oblig'd to sit upright. But before that time, although he could lie with less difficulty on the right side, and soon after that on the left, yet he could not lie down on his back, in my opinion, for this reason, because although the lungs, like the right lobe of the old man last spoken of (*p*), were inflam'd and heavy, yet they were not, like his, free from the pleura. Wherefore, this man could not lie supine, but the pleura, to which the lungs were connected, being dragg'd away from the anterior part, caus'd an uneasiness, and did not permit this situation. But what relates to the hernias belongs to another place. However, they recal to my mind an observation of another man who had a hernia, in whose peripneumony there is something relative to lying down, as you will immediately perceive.

26. A man, of fifty years of age, having had from his birth, a brown complexion, an atrabilious constitution, and a great propensity to venery, was seiz'd, on the twenty-first of December, with a difficult respiration, as if it had been from a catarrh. The disorder grew gradually more violent, so that on the 19th of January, in the year 1690, he was oblig'd to take to his bed. His voice was very hoarse and hollow; he had a plentiful

spitting of watry matter; his respiration was very difficult, with a sense of strangulation, as it were, about the fauces: he could not lie on either side without difficulty, but he had more difficulty to lie on the left, which made his breathing more oppressive. At length, it became suspirious, or panting, nor could he breathe but with his neck upright. In the progress of the disease, however, the great quantity of that watry discharge was somewhat chang'd into a little quantity of viscid, tough matter, which had, in some measure, a strong smell, and his respiration became easier, though the sense of suffocation still remain'd. The fever was always slight. Nevertheless, on the twelfth of February, he died.

His chest being open'd, the right lobe of the lungs was found to be little different from its natural state: but the left adher'd universally to the pleura, without any space interpos'd, and its substance was very hard, and inflam'd. In each of the ventricles of the heart were distinct polypous concretions, what Valsalva had not yet seen; that in the left was the greatest. The fauces, where, perhaps, the greatest disorder was, it was not permitted to examine.

When the belly was open'd, the spleen was, on all sides, found tied to the neighbouring parts, by membranes that were interpos'd; and in this viscous, the arterious vessels were cartilaginous. As a hydrocele was observ'd in the right side of the scrotum, in the second place, an aqueous humour was also observ'd to be compress'd, betwixt the tunica albuginea and testis: and some limpid drops of this water distill'd from that membrane, especially where it was compress'd, at the side of the larger small vessels. This humour, over a strong fire, coagulated into a very white substance; but over a more gentle heat, was gradually dissipated by evaporation, and left marks of lymph behind.

27. As to the hernia, although under the tunica albuginea I have seen another very thin membrane, which immediately embrac'd the substance of the testicle, so that the water might be shut up betwixt these two membranes; yet, considering what is immediately subjoin'd, I should rather suppose, that Valsalva did not mean to write what he has written, and what I have faithfully copied, but between the tunica vaginalis and albuginea.

Yet be this as it will, it is not one circumstance only, that keeps my mind suspended in regard to this history. Whence did that sense of strangulation arise? For it could not here, as in some peripneumonic patients, whom Gagliardi (g) mentions, whose case was mistaken for an angina, be accounted for from the quantity of pus which was in the lungs. Why should the difficulty of breathing be made less, from the time that the expectorated matter, instead of being in great quantity, became much diminish'd?

And why was a slight fever, only, join'd with a peripneumony? for that this patient did labour under that disorder, Valsalva, who saw him when living, and dissected his body when dead, did not hesitate to suppose; for he had prefix'd to this observation, by way of title, *De Pulmonia*. At length, to omit other things, why was it difficult for him to lie on either side, when

the lungs of one side only were affected? And even why was it more difficult for him to lie on the left side than the right, when it was the left lobe that was affected? If any thing of such a nature had preceded, that we could refer the cause of an impediment not sufficiently understood, to an injury of any latent part, as in the case which I shall immediately subjoin, it would be more allowable for us to take liberties in forming conjectures.

28. A young man, of fifteen years of age, had a fall in quarrelling, and dash'd his back against a stone, about the last vertebra of the thorax, and the first of the loins. The young man, who was his adversary, leap'd upon him as he lay, and press'd his chest with his knees. He who had fall'n, complain'd very much of pain about the part where he receiv'd the blow; yet there did not appear any mark of injury that was worthy of notice. He had much pain in his head; and while he endeavour'd to go about his usual business at home, was seiz'd with a syncope. On that first day, he was immediately observ'd to have a great loss of appetite; and after a day or two more, a fever came on. There was, before this, a continual pain in the chest. To the pain was added a difficulty of respiration, and a cough, which two symptoms were afterwards made more violent, and, at the same time, his expectoration was bloody, and he discharg'd a reddish matter by stool. A delirium also came on, attended with convulsions, so that all his body remain'd immoveable: and at length he died, about the tenth day from his fall: in all which time, the patient was never able to bend his back, but was under a necessity of keeping it extended. When the body was open'd, no greater mark of injury was found about the internal surface, than was seen on the external, where the blow was receiv'd. But perhaps the hurt, that caus'd the mischief, was upon the spinal marrow, and the nerves, as they lay in the interior parts of the vertebræ, which we were not permitted to examine. However, the upper part of the lungs was inflam'd on the right side; and on the left was found to be a little hard, the right lobe adhering strongly to the pleura, and the left being quite free.

29. I have interpos'd so many observations relating to lying down, and the situation of the body, that I suppose you have almost forgotten those which I had promis'd (*r*), relative to serum being collected in the thorax, and pericardium, of peripneumonic patients. The first of these will relate at once to that, and to lying down, and will moreover shew, how far the inflammation of the lungs sometimes belies the inflammation of the liver.

30. A clergyman, who had just enter'd into his twenty-third year, had, three years before, labour'd under an acute fever, with a swelling of the parotid glands: and when he had got rid of this, he fell into a double tertian, which, after troubling him long, went off indeed, but left a pallid colour of the face behind it, and a wasted habit of body in some measure; besides that, his respiration was at times difficult, his nights frequently disturb'd, and his urine almost always red. To these symptoms, at length, an acute fever was added, which, on the second day, was attended with a pain below the false ribs, on the left side, and below the ensiform cartilage; and this pain was exasperated by the touch. On the first days there was a vomiting and diar-

rhœa, also a cough, that was somewhat moist, but this became dry and fruitless, after a very few days. It was difficult for him to lie on either side, so that he could not lie down at all, but on his back; and he felt a violent heat in his back, towards the right kidney: his pulse was quick, frequent, unequal, and intermitting. Vallalva was much wavering in his own mind, in regard to the situation of the disease. Yet as the patient discover'd no sign of pain in the thorax, but always pointed with his own hands to the place I have mention'd, that is, to the region of the liver, he at length suppos'd it to be an inflammation of the liver. In the mean while, the disease growing more violent every day, and the difficulty of breathing increasing continually, as well as the weakness of the pulse, he died upon the conclusion of the seventh day.

The dissection of the body, says Vallalva, with an ingenuousness worthy of him, "detected the error of my judgment." For all the viscera in the belly were sound, except that the spleen was four times as big as it ought naturally to be. But in the left cavity of the thorax, limpid serum stagnated, to the quantity of two pounds or more: the right was full of a thicker serum, some parts of which had in a measure concreted, so as to resemble a kind of membranous bodies, swimming in that liquor. The lungs, indeed, were free from the pleura; but the right, although its bulk was not much increas'd, was, nevertheless, entirely indurated, from inflammation. The pericardium was much larger than usual, being thus dilated by the serum it contain'd. The right ventricle of the heart, besides a small polypous concretion, was full of coagulated blood, with which the neighbouring auricle was extremely turgid. Blood of the same kind also, but in less quantity, was found in the left ventricle.

31. What happen'd to Vallalva, might much more easily have happen'd to most other persons, I mean, to believe that, which was in fact an inflammation of the lungs, to be an inflammation of the liver, as, on the other hand, I know it has happen'd to some, that they have taken an inflammation of the liver for an inflammation of the lungs; examples of which you have in the *Sepulchretum*, in the thirty-sixth observation: and I point out this in particular, in order to shew you, that what signs are enumerated, as being peculiar to the liver, were, nevertheless, in great measure, not wanting in the clergyman. So easy is it, sometimes, to be deceiv'd in the practice of physic, by those very appearances which seem to prevent us from falling into deceptions! This clergyman had symptoms, also, which were the effects of remaining foregoing disorders: so that if any one consider'd them in conjunction with those which had lately attack'd him, he was much more liable to be deceiv'd. And, indeed, as to other symptoms, which you may, perhaps, require, to mark out an inflammation of the liver, either even they were not wanting, although they might possibly be omitted by Vallalva, in such a number of circumstances, or if they were wanting, yet they might have existed, those morbid appearances only being suppos'd, which were found in the body after death; or, finally, if you do not readily grant this, at least you must grant, that most of the signs of an inflam'd liver were here present; and that it is very rare, in the practice of physic, to find that all the signs of any one disease, whatever, concur in the same body. And for

this reason, it becomes physicians to be more cautious in that part of their profession, which by Hippocrates (*s*) is justly call'd "difficult;" I mean, in forming a judgment of diseases, but especially where, in the same region of the body that is affected, many parts lie conceal'd, as in the present case. For behind the liver, the right lobe of the lungs was inflam'd, to which also was owing the sense of heat at the back, towards the kidney of the same side: and although that lobe was not so much increas'd in bulk as might have been expected, yet still it was increas'd, and the serum was moreover very thick, with which the right cavity of the thorax was fill'd: and this serum urging the septum transversum downwards, and forwards, press'd upon the liver, and that viscus being again press'd back by the false ribs, or their cartilages, and by the abdominal muscles, especially at the time of respiration, and still more if you applied your hand thereto, compress'd the inflam'd lungs, and caus'd an uneasy sensation.

To this add the bulk of the spleen, which was increas'd in a quadruple proportion, and which, without doubt, confin'd the liver into a more narrow compass, laterally. And from hence you will also account for the difficulty that he had in lying on his right side; for you see that it ought to have been on the left side, from the lungs of the opposite side being heavy, and from so great a quantity of serum being in that cavity, which urg'd the mediastinum into the left cavity of the thorax, and by that means so much the more oppress'd the other lobe, with which only the patient breath'd, in proportion as this lobe was already more impeded in its motions, whether on account of the serum, which was also effus'd into its cavity, or on account of the bulk of the spleen, lying upon that part of the diaphragm which was nearest to itself. And these things seem to have exist'd, even from the time of the long foregoing fevers, in this clergyman, just as it did in that carman, of whom we spoke in the beginning (*t*). But these marks, which we have said preceded, create no slight suspicion, whether, before this inflammatory fever came on, serum was not collected in the cavity of the thorax of this clergyman. And as this suspicion arises, also, in the two histories which I shall immediately subjoin, I chuse rather to add after these what I think of this question in each of them.

32. A virgin, of sixteen years of age, whose menses had been suppress'd for eight months past, being in a bad habit of body, and spitting up a catarrhus matter, having also some difficulty in the motion of respiration, and being accusom'd to complain of a certain heat and irritation in the left part of the thorax, was suddenly seiz'd with a laborious orthopnoea, so that she could not by any means lie down, having an expectoration of catarrhus matter mix'd with blood, and a sense of an oppressive weight in the same left part of the thorax, together with a hard pulse, a coldness of the extremities, and at length with death itself, on the fourth day, from the beginning of the orthopnoea.

In both cavities of the thorax, was found a limpid serum, which, when set aside, in like manner, as the blood shews, by standing, a red coagulated part, separate from the serous, shew'd a concreted substance in the middle

(*s*) S. I. Aph. I.

(*t*) N. 2.

of it, like a jelly, and separated from the rest of the serum. This serum also, when set over the fire, concreted in the same manner as the serum of the blood. However, the whole left lobe of the lungs was extremely hard. In the right ventricle of the heart was a very large polypous concretion; in the left was another, but less. And in the belly, the gall-bladder was observ'd to be very small, having its coats much thicken'd, and preserving but slight traces of the bile.

33. An old man, of seventy-four years of age, was seiz'd with a pain of the right side, which was troublesome, rather by a sense of weight, than in any other way, but was more uneasy, if he lay on the opposite side, wherefore he lay on the right side only. The pain was accompanied by a troublesome cough, a bloody expectoration, a pain of the head, watching, and especially a violent fever, with a pulse, hard, and frequent, but not very turgid. He died on the third day.

While the thorax was open'd, serum burst forth from its cavity, with which it was entirely filled. Was it secreted by the force of so short a disease? or had it been previously collected? The lungs which were in that cavity being black, and affected with inflammation, and besides that hard, very compact, and easily separable from their external membrane, adher'd to the pleura, towards the scapula, by little membranes. The left lobe had scarcely receiv'd any injury. In the right ventricle of the heart was a small polypous concretion, extending, in great measure, to the right auricle; and another more slender in the left: the former was produc'd into the vena cava and pulmonary artery; and the latter into the pulmonary vein to a short tract, but into the great artery to a long extent: both of them were attended with coagulated blood.

34. What Valsalva doubted of in this old man, whether the serum had not been already effus'd into the thorax, before the inflammation of the lungs, it would have been more easy to believe, if any sign of such extravasation had preceded, as I have observ'd that in the virgin, and the clergyman, more than one did precede. Both of them were previously cachectic, and the virgin so far, that no trace of bile was preserv'd in the cist, from which any one, who was pleas'd with that very improbable opinion of Drake (*u*), that the bile is the cause of the menstrua, might perhaps draw an argument in favour of his hypothesis, in consideration of the long suppression he had labour'd under. And the clergyman had red urine, and disturb'd sleep by night. Finally, to omit other things, the respiration of neither of them had been entirely healthy. And also this is customary in a bad habit of body, yet the blood also, is wont in such a state to abound with much serum, and easily to deposit it here and there. Wherefore, if you think that in these two, a part of the serum had before stagnated in the thorax, the remainder of which was added by a new disease, I shall readily assent to it. Nor would I even obstinately deny it in the old man, as the foregoing symptoms might have been unknown to Valsalva, for this reason among others, that decrepid old people are us'd to ascribe most of their indispositions to age, rather than to disease, and for that reason neglect them: and as it seems surprizing, that

(*u*) Anthropol. book 1. ch. 23.

so great a quantity of water could have been collected, in the cavity of the thorax, in the space of three days. Do not, however, imagine, that what I do not disallow here, in these three persons, takes place in the other peripneumonic patients, who had a serum extravasated in the cavity of the thorax. For Coiterus, as I have told you before (x), has observ'd, that "peripneumonies" are in the number of these diseases, "which a drop of the thorax attends;" and in the observations of Valsalva, and mine, you will also find so many in which both these diseases were join'd, that it is not probable they had all previously labour'd under a drop of the thorax, and pericardium; for this last likewise, is very frequently join'd. And it is even certain, that most of them were in very good health, before they were seiz'd with an inflammation of the lungs: as when a person, in the highest habit of health, has expos'd himself, when hot from exercise, to a very cold air. For if the circulation of the blood, through the small vessels of the lungs, be retarded in this man from that cause, and the innumerable, but invisible particles, which are continually going out from the internal membrane of the lungs, and the external surface of the body, are obstructed; these particles will endeavour to procure themselves an exit, through other small foramina of membranes, and especially of those, which, being at that time more hot, have their pores more open, that is, those which invest the thorax internally, and its viscera: and this exit will be so much the more easy, as the transit of the blood, through the lungs, is more difficult, and approaches nearer to stagnation, and as the exertions of the chest, in order to expedite its motion, either in respiration, or in coughing, are more frequent and strong. For, by these means, the humour will be the more plentifully press'd out, from the pores of the membranes: which, when once they have been relax'd and dilated, will continue, even of themselves, to afford a very easy egress to the serum. And all these things will be the more readily brought about, in those persons, whose membranes are at that time most prepar'd, and dispos'd thereto, and the blood, at the same time, most impregnated with aqueous particles. But, if either of these circumstances, or any of those just now mention'd, shall be dispos'd in a contrary manner, then the extravasation of serum into the thorax, and pericardium, will be very slight, or there will be none at all. For even in the observations hitherto propos'd, as they are partly those, in which water is describ'd to be found in the thorax, and pericardium, so they are partly those, in which it is not mention'd; and there is even one where it is expressly remark'd (y), that there was no water in the pericardium.

But I will here give the histories of two young men, in whom there was a great quantity; which histories I remember to have promis'd you before (z).

35. A young man, of almost four and twenty years of age, was seiz'd with a pungent pain in the left part of his thorax: he breath'd with difficulty, he had a great thirst, and a violent cough; but expectorated nothing. He lay only on his affected side, and was more free from uneasiness, when he hung down his head. At length, his respiration growing more and more difficult every day, on the sixteenth day he died.

(x) Epist. 16. n. 33.

(y) *supra*, n. 24.

(z) Epist. 16. n. 45.

The left lobe of the lungs was connect'd all round, very closely, to the neighb'ring parts, and was inflam'd; and indeed, about the clavicle, already suppurated. The pericardium was dilated with a very great quantity of water, so that this might be deserv'dly call'd a drop'sy of the pericardium. It was also much thicken'd in its coats, and to these coats internally, as well as to the outside of the heart, some concretions of a whitish substance adher'd, in several places. The heart was also encreas'd in its bulk: and while it was cut open, a fluid blood flow'd out from its ventricles. Yet in these cavities, notwithstanding, were polypous concretions also, that in the right being pretty large, and that in the left of a smaller size.

36. Another, who was about two years younger than him spoken of above, having complain'd first of a pain in his belly, and this going off, was at length seiz'd with a pain in the thorax, a difficult respiration, and a troublesome thirst. He lay continually in a prone posture, yet so as to incline to the right side; and held his head stooping downwards, as most of those patients generally do, who have water in the pericardium in great quantity. Finally, all the symptoms growing more violent, he died about the same time of the disease as the former, that is, about the sixteenth day.

In the left cavity of the thorax a limpid water stagnated, in which the lungs of this side was in every respect found and free. But the lungs on the right side were indurated, and adher'd to the parts around them, and especially towards the scapula; where there was a humour, like the whey of cow's milk, and in it some concretions, resembling the white of an egg condensated, in hot water. In the pericardium was just the same kind of humour, having the like concretions in it, and adhering to the internal surface of it, and the external of the heart, in such a quantity, that the pericardium being distended from these causes, took up a great space in the cavity of the thorax. The ventricles of the heart contain'd polypous concretions, the right a larger one, and the left a smaller.

37. What relates to the drop'sy of the pericardium, I have already taken out from these two observations (*a*), and consider'd. And as to the concretions, adhering internally to the pericardium, and externally to the heart, or swimming in the serum, which was extravasated in the cavity of the thorax, and resembling the white of an egg condens'd, we are to suppose just the same, as of the other concretions, that are found swimming elsewhere, in the form of a jelly, or of little membranes, or like a reticular body, or the coat of some vessel, lying upon the surface of the parts spoken of, and often even of the lungs, or the pleura, as I have already describ'd in this letter (*b*), and in others (*c*); and shall hereafter describe. That is to say, as I have already taken notice, and as Valsalva has mention'd above (*d*), in express terms, that they are form'd from a portion of the extravasated serum, being concreted. For as the pores of the membranes are more or less dilated, from the causes above mention'd (*e*), so more or less particles, of a thicker or thinner consistence, are extravasated together with the serum, that are capable of concreting.

(*a*) Ibid.

(*b*) n. 32, 30, 20.

(*d*) n. 30.

(*c*) Epist. 16, n. 17, 30, 38. & epist. seq.

(*e*) n. 34.

& alii.

and, for this reason, form those various concretions, especially at that time, as I suppose, when the motion of the heart, lungs, and even of the heart itself, is become very languid; and finally, when, after death, it ceases entirely; so that the serum being agitated but little, or not at all, suffers these particles to combine one with another, or be deposited.

And thus far I had written, when I lit, by chance, on the tract of a learn'd man, who having made many observations about concretions of that kind, thinks them to be of the same nature that Valsalva and I have thought them; but as, in his explication, there are some things in which we agree, so there are some again in which we differ: yet I am not accusom'd to dispute, willingly, on such subjects as these. I will rather say this, that nothing occurs more frequently, contrary to what he seems to believe, than concretions of that nature, when we find much serum in the thorax, or pericardium, as this letter, and other of ours, shew, especially, when the lungs "are very hard," in an equal proportion, larger than usual, and more heavy," that is, as I understand it, inflam'd. But besides our observations, there are the observations of others, and those not a few, even in this fourth section of the Sepulchretum, to go no farther; as that of Panarolus (*f*), who found the heart entirely whitish on its surface, and cover'd with floating filaments, or, to use his own words, "towy" in its appearance, by reason of the matter adhering to its coat; and that of Harderus (*g*), who describ'd the pericardium "as internally rough and hairy, and cover'd over, as it were, with velvet," and the heart "surrounded with a thick lymph, which could be taken off, like a bark, that encompass'd it;" and, to comprehend many observations in one, as that of Guarinoni (*h*), who affirms, "that he had seen in most of those who had died from the oppression of pain in the side, and peripneumony, that the heart was cover'd with a white crust, or that the heart was cover'd with a kind of down, or sediment" (*i*), as he had said above (*k*), where he also testifies, that in bodies of this kind, he had not only "very often seen the cavity of the thorax full of a watry fluid, but of a white fluid," and also the lungs full and hard," as was before pointed out (*l*); "and when the very thick coat which had been form'd upon them, was wip'd off, they appear'd as if they had been affected with an erysipelas." And I seem, to myself, in this place, as I consider what more frequently, or more rarely occurs, according to my manifold observations, to be more capable of believing, that a thick concretion of a membranous form, was seen by Guarinoni, to be lying upon the lungs: nor am I quite free from suspicion, that the concretion was probably of the same kind, but thinner, which is, above by Valsalva (*m*), call'd an external membrane, easily separable from the lungs of the old man, which were hard.

38. But you, perhaps, rather wish to know, why in some of the histories last produc'd, together with a peripneumony, there were some symptoms of a pleurisy, as in the first young man, a pungent pain, and in the old man, whose history precedes his, a hard pulse? First, then, as to what relates to

(*f*) Obf. 20. § 7.

(*g*) In Additam. obf. 11.

(*h*) Ibid. obf. 2. § 2.

(*i*) Vid. epist. 45. n. 16.

(*k*) Obf. modo cit. § 1.

(*l*) n. 21.

(*m*) n. 33.

the pungent pain, take this; that they who, among the more modern physicians, have stood up learnedly, and ingeniously, for the antient feat of the pleurisy, even they, I say, readily allow more than one way, in which, when the lungs are inflam'd, a troublesome, and even an acute pain may be perceiv'd: and that the same persons by no means disallow, that a pleurisy, absolutely speaking, may exist without this acute pricking pain, or, at least, be only accompany'd with a slight one: all which circumstances I would have you call to mind; for they are true, and you will see that they perfectly agree with both Valsalva's observations, and mine (*n*). And as I have readily perceiv'd this, in reading these letters over again, so, also, I have readily seen, in what manner other very excellent men do not doubt, but the pulse in a peripneumony may be sometimes soft, and sometimes hard.

For although the arteries of the lungs, if you except the bronchials, are not, like all the rest, and among these the intercostals, continuous with the aorta, so that they can communicate all their irritations to the whole of this artery; yet the vessels of the lungs, being irritated with that vehemence, may urge the blood into the left ventricle of the heart: so that this, being irritated, may vehemently compel the blood into the aorta, and so irritate that vessel, till, the vessels of the lungs being compress'd, and obstructed, from the inflammation being encreas'd there, less vehemently impel the blood, and in less quantity, into that ventricle, and this ventricle into the aorta, and by this means, the aorta being less and less irritated, the pulse become less hard, and even soft. All which circumstances, in relation both to the pungent pain, and the hardness of the pulse in peripneumonies, I was willing to take notice of to you here, that you may add what is to be gather'd from hence, to those things, by which I have endeavour'd to explain both the one and the other, in the matron whose case I describ'd above in this letter (*o*), and in like manner to those things, by which I shall now explain each of these symptoms also, in a different manner, in the old and the young man at present spoken of. For the hardness of the pulse, in the old man, already more perhaps, than seventy-four years of age, may seem to be rather the effect of age, by which all the parts grow rigid, than of disease. And if in the young man I should refer that pungent pain to the strong connexion of the inflam'd lungs with the pleura, should I not be able to explain the thing in such a manner, as to make you understand, that the pleura, although not inflam'd, suffer'd distraction, as often as the lungs, which were already distended, though not entirely by inflammation, were still more distended by the air they took in: and that by this very action all the points of the surface of that viscus, are drawn asunder from each other, and there is consequently an attempt, as it were, to tear asunder the annex'd pleura? And in this manner nearly, you will see a case, almost similar to ours, explain'd in the Sepulchretum (*p*). Are they all then, you will say, affected with a pungent pain, whose inflam'd lungs adhere to the pleura? Not all, certainly, as even many observations in this letter shew; for although Valsalva may, perhaps, have forgotten to speak of a pungent pain, in some one of them, yet it is not to

(*n*) Vid. histor. seqq. & epist. 21. n. 17.

& histor. seqq.

(*o*) n. 9. & 10.

(*p*) Sect. hac 4. in schol. ad § 10. obs. 20.

be suppos'd, that he had forgotten it in so many others. How is it then? In some, perhaps, the connexion of the lungs with the pleura is less close; and in some the lungs, towards the surface, may be so obstructed by the inflammation, and be grown so hard, that they cannot be distended in that part by the inspir'd air; and in others, finally, there might be some other cause, why, though we should suppose this connexion, yet there might not be a pungent pain. And the reason why this does, or does not, happen, is sometimes very evident; but, to confess the truth, is also sometimes very obscure, or at least does not easily occur to the mind. Both of which you may conceive of from the following observations.

39. A man, about threescore and six years of age, having long spit up a catarrhus matter, was, at length, by being expos'd to the injuries of a very cold air, seiz'd with a pungent pain of the left side: he cough'd very much, and was feverish. Having, from the very beginning of the pain, spit up continually, a great quantity of thick and yellow matter, streak'd with bloody lines, he at length died, on the seventh day of the disease, in consequence of his expectoration being wholly suppress'd.

In the left cavity of the thorax was water, like the whey of cow's milk: and the lungs of that side, which were in a very hard state, adher'd strongly to the mediastinum, and pleura, that invested the ribs. And in the same manner, the lungs of the right side were attach'd to the mediastinum and pleura, where it invested the diaphragm, and especially where it invested the upper ribs, anteriorly. At this last place, a cancerous ulcer lay hid in the lungs, the seat, perhaps, of an inveterate disease. In the left ventricle of the heart was a small polypous concretion, and in the right a pretty large one, to which a quantity of coagulated blood adher'd. In the belly, the colour of the spleen was observ'd to be inclining to a red.

40. If you justly approve the conjecture of Valsalva, in regard to the seat of an ancient disease, you understand, then, how patients are sometimes impos'd upon by the name of catarrhus matter; and I wish I could suppose physicians to be wholly free from such impositions. But this only by the way. I would here have you principally attend to this circumstance, that on the same side where the pungent pain was, in that side also the inflam'd lungs adher'd to the pleura; inflam'd, I say, although Valsalva has neglected to mention that difficulty of breathing, which, in disorders of this kind, is suppos'd not to be entirely wanting; just as in the following, and other observations, he has omitted to mention fever, notwithstanding those observations, as well as the present, are superscrib'd by his own hand, with the title of *De Pulmonia*.

41. A woman, of sixty years of age, was seiz'd with a pungent pain in the right part of the thorax, so that she could by no means lie down upon it. She was troubl'd with a cough; she spat up but little: she breath'd with some difficulty, but that not very great: her strength was entirely gone. Her pain, however, remitted afterwards so much, that she could now lie down on the right side again, with ease. But in the mean while, the pulse failing more and more every day, at length life fail'd also.

The thorax being open'd, both lobes of the lungs were found to adhere to the pleura, but the right most closely. This last-mention'd lobe, also, had

had grown univerſally hard, eſpecially in its upper part; where there was an abſceſs, which, when cut into, diſcharg'd a great quantity of browniſh ferum. With this very colour, the neighb'ring ſubſtance of the lungs, alſo, was infected, which in ſome meaſure had been leiſ'd with a ſphacelus. The left lobe of the lungs, conſiſting, not, like the right, of one lobe, but of many ſmaller lobes, was, on its poſterior part, ſlightly inflam'd, and on the whole of its remaining external ſurface, was diſtinguiſh'd here and there with black ſpots. In the pericardium was much water. In both the ventricles of the heart was a large polypous concretion; but that in the right was largeſt. The belly alſo being cut aſunder, within the external part of the ſpleen was found a certain bony body, which was altogether of a ſpherical figure. And in the veſſels of this woman, the blood was almoſt univerſally concreted.

42. The bone in the ſpleen, and the greater number of lobes found in the lungs on the left ſide, contrary to what is generally found, being here omitted, as belonging to another place; unleſs you may, perhaps, ſuppoſe, that from the effect of inflammation, the three lobules of the lungs on the right ſide, had coaleſc'd into one; you eaſily conceive why, when this inflammation began to degenerate into ſphacelus, that remiſſion of the pain neceſſarily follow'd, which has too often impos'd upon ſome phyſicians, in a manner that reflects much upon their judgment, in not attending to other ſymptoms, as you ſee alſo in this ſection of the Sepulchretum (*q*). But before the fibres were in ſome meaſure relax'd by the approaching ſphacelus, that inflam'd lobe which adher'd to the pleura cloſely, ſo diſtracted this membrane, that the woman, by reaſon of the great pain, could not bear the preſſure, which this ſide muſt ſuffer in lying upon it; though other peripneumonic patients, when the vehemence of the pain is not ſo great, are accuſtom'd to lie upon the affected ſide, and eſpecially thoſe in whom the lungs are, in like manner, connected with the pleura. And even they, who in ancient, and in modern times, did not doubt that an inflammation of the pleura very often happen'd without an inflammation of the lungs, have taught, that, in pleuritic patients, “ lying down on the inflam'd ſide is “ eaſy, for the pleura was then plac'd in its proper place, and natural ſituation: but that lying on the oppoſite ſide excited the pain, for from the “ weight, phlegmon, and ſuſpenſion upon all the contiguous parts of this “ membrane, the pain is greatly increas'd.” Theſe are the words and explanation of Aretæus (*r*). To which has alſo been added this other explanation, that, as it is certain, that the ſide which is compr'eſs'd in lying down, is much leſs agitated in reſpiration, than the oppoſite, which is quite free and unreſtrain'd in its motion; ſo it ſeems that the pleura is leſs agitated and extended, where it adheres to the compr'eſs'd, than where it adheres to the free, ſide. And you ſee how far it is allowable to transfer theſe explanations to the pleura, to which the inflam'd lungs are connected.

Yet, nevertheleſs, theſe very ſame perſons have obſerv'd, that it ſometimes happens otherwiſe in regard to lying down; as is evident from Cælius

(*q*) Obſ. 22.(*r*) Morb. Acut. l. 1. c. 10.

Aurelianus (*s*), who has advanc'd still another explication. And if you consider this, you will perceive, that it agrees with those who lie most easily upon the affected side, and not with those "certain persons, who are prevented from lying on the affected side;" so that it appears, even from hence, that these persons are rarely met with, and the first very frequently. Nor ought it to be any objection to this supposition, that we read, before these, the following words in Cælius (*t*): "A difficulty of lying on that side attends this kind of patients, and when they turn themselves on the contrary side, a pain." For although by "that side," I cannot understand with others, the side which is sound, not only because Cælius had not mention'd the sound side, but the diseas'd; but also because, by this means, I must understand "the contrary side," which he immediately mentions, yet I suspect, that at this passage, either there is some fault in the copies, which are in many other respects very false, as, for instance, if the last syllable of *jacendi*, being repeated by the careless copyists, the word *difficultas* had arisen therefrom, instead of *facilitas*, or *facultas*: or if we must read *difficultas*, I understand it thus, so as to suppose, that there is, indeed, an uneasiness in lying down even on the pain'd side, yet that this is by no means to be compar'd with what is occasion'd by lying on the contrary side. So I see, that in the woman in question, Valsalva has, indeed, mention'd her incapacity of lying down on the affected side; but I should not, for this reason, believe, that there was not a much greater, and more excruciating pain, when she endeavour'd to lie down on the sound side; nor does he deny this: or if it was not so, I am then compell'd to return to what I have already confess'd above (*u*); I mean, that the cause of lying down with difficulty, is not always evident: as, for example's sake, if not only the pleura, but the pericostum, which lines the ribs in every part, by reason of the very close connexion of the lungs in this woman, and of the lungs being distended, both by inflammation, and by abscess, had been so distracted, that it could not have been press'd upon by the weight of the incumbent body, without very great pain.

But be this as it will, although I remember to hear Albertini say, that in a peripneumony, it was sometimes easier for the patient to lie down on the pain'd side, and sometimes on the opposite; nevertheless, I also remember, that Valsalva, when he allow'd this, made the following distinction: I mean, he asserted, that the first happen'd to a very great number of patients, and the last only to a few: and the observations he has left behind him in writing, if compar'd one with another, sufficiently confirm it.

43. A virgin, aged two-and-twenty years, was seiz'd with a fix'd and pungent pain of the right side, together with a cough, spitting, difficult respiration, and fever. She could lie down in no manner, except on the right side. In the progress of the disease, the spitting was ting'd with blood, which was discharg'd to a considerable quantity in one day. Some days before

(*v*) Acut. Morb. l. 2. c. 16. n. 98. edit. Almelov.

(*t*) L. eod. c. 14. n. 91.

(*u*) N. 23.

death, she was troubl'd with pains about the ilia. And on the ninth day, convulsive motions coming on, she expir'd, as she lay on the left side.

In the cavity of the abdomen serum was observ'd; the spleen was very large; and the greater part of the small intestines inflam'd. The thorax being open'd, the right lobe of the lungs was found to adhere closely to the pleura, and the whole substance of it to be greatly affected with inflammation, and moreover with an ulcer on the side towards the pleura, in a certain place, betwixt which ulcer and the pleura was a serous matter. And the left lobe of the lungs, besides that its colour inclin'd to black, was distinguish'd also here and there, with black spots. There were some ounces of serum in the left cavity of the thorax, in like manner. In the heart were two polypous concretions: the least of which lay hid in the left ventricle; and the largest fill'd up the whole cavity of the right auricle, which was much dilated.

44. In those persons whose blood is dispos'd to create inflammations, it happens not unfrequently, that many parts are inflam'd at the same time, or at least, one after another, and especially the parts of the thorax. Other instances of which, seem to be in some measure pointed out, in this letter, besides the example of this virgin; for in the man spoken of a little above (x), the colour of the spleen inclin'd to red under the inflam'd lungs: and in the young man (y), before the lungs were inflam'd, the pain in the belly had signified what disorder some one of the viscera was threaten'd with.

However, the pungent pain in this virgin seems to have been milder, than in the woman whose history I last of all (z) related. For the virgin lay down on the affected side, which the woman could not do; although she, at length, lay upon the other, after that the serous matter of the ulcer had relax'd the fibres of the pleura, whereby it more easily bore the distraction from the lungs, that were attach'd to it.

From the connexion therefore, of the lungs with the pleura, it was lawful for us to account for the cause of the pungent pain, in the method which is pointed out above (a), in these three observations. But in as many that follow, it will not be lawful to account for it from the same cause, unless we, perhaps, do it by way of conjecture.

45. A man of fifty years of age, was, on the second of March, seiz'd with an acute fever, and laborious respiration, attended with a pain, which reach'd from the sternum, quite to the middle of the abdominal muscles, and a very troublesome cough, inasmuch as it caus'd a great pain at the right nipple, and the false ribs. He could lie down on neither side: he did not spit any thing: he died on the fifth day of the disease.

In cutting out the sternum, a little quantity of brown serum flow'd out of the cavity of the thorax, on the left side. The lungs, which were in this cavity, had become much indurated, being inclin'd to a greenish colour, and distinguish'd with black spots; and when they were cut into, a serous and putrid colluvies burst forth, having blood mix'd with it. In the ventricles of the heart were polypous concretions.

46. In this case indeed, it appears into what fatal disease, the inflammation of the lungs had degenerated. But it does not appear, why he could not

(x) n. 39.

(y) n. 36.

(z) n. 41, 42.

(a) n. 38.

bear to lie down on either side, nor yet why the pain should reach from the sternum, quite to the middle of the abdominal muscles; unless you lay it to the charge of that very troublesome and dry cough, from which, at least, that pain at the left nipple, and the false ribs, was believ'd to be brought on. And if this pain was pungent, as it seems to have been, and as it generally is, the cause of it is not sufficiently understood, unless you conjecture that the adhesion of the inflam'd lungs to the pleura, in these places, was perhaps omitted by Valsalva: and this being suppos'd, it will more easily appear, how, in the cutting out of the sternum, notwithstanding neither of the thoracic cavities was full of serum, that small quantity of brown serum might issue forth from the left cavity, that is to say, from the surface of the annex'd lungs, which overflow'd with putrid and serous colluvies in consequence of being lacerated. But this is conjecture only. Yet if we had read, that with this peripneumony, an inflammation of the pleura was join'd; we could then more easily understand most of the circumstances, which really happen in some pleuritic patients, and are observ'd by Cælius Aurelianus also (*b*), as a pain at the "breast, & ilium, an incapacity of lying down, and an anxiety " in any posture."

47. A young man, of about twenty-six years of age, was seiz'd with a pungent pain in the right side of his thorax, with a fever, and cough. He spat up but little. About the eighth day a delirium came on, and particularly in the night. The pain went off; but the difficulty of respiration always became more violent. He could lie down easily on either side. At length, he died on the tenth day.

Both lobes of the lungs had grown entirely hard: both of them were connected to the pleura, towards the back, and the left laterally. Besides, as a certain white substance, of a membranous nature, was laid, as it were, upon the pleura, universally, and upon the lungs, though almost like some soft, and lax, reticular body; yet by means of their substance, the lungs and the pleura were, in some places, firmly tied one to another. In both the cavities of the thorax, but more in the right, there was a great quantity of moisture, in colour like the whey of cow's milk: which, although when set by, it shew'd no separation, as has been observ'd on a previous and similar occasion, yet when put on the fire, coagulated, nevertheless, like a bloody serum. The pericardium was turgid with serum. In the heart were polypous concretions, that which was in the right ventricle being largest, and that in the left smallest.

48. As the brain was not examin'd, it is not possible to know, whether any inflammation was there also, to which, agreeably to what has been said a little above (*c*), the delirium ought to be imputed. Yet to this I impute the cessation of the pain, without any just cause; for which reason, it became easy for him to lie down on which side he pleas'd. For, after Hippocrates (*d*), Celsus (*e*), as you very well know, has admonish'd, "that they " in whom the cause of pain exists, without the sensation of it, are disorder'd " in their senses."

(*b*) Acut. Pass. l. 2. c. 14. (*c*) n. 44. (*d*) S. 2. Aph. 6. (*e*) De Medic. l. 2. c. 7.

But why was the pungent pain in the right side of the thorax, when the lungs attach'd laterally to the pleura indeed, were attach'd, not on the right side, but on the left? For as to the connexion on the back-part, that is quite out of the question, because there was neither any pain in that part, nor was there any thing particular in this connexion, as it was common to both sides. Are therefore the attachments which lay hid, as it were, under a certain membrane of a soft substance, on whose nature, and origin, I have sufficiently spoken before (*f*); I say, are these attachments, which were pretty firm, and strong, to be more attended to by us, on this occasion? But these are pointed out in some places only, and as it seems on both sides. It remains therefore to conjecture, that those larger ones which were in the right cavity were more firm, and prior to the delirium, in which cavity also, the greatest quantity of extravasated humour was found.

49. A woman of sixty years of age, of a slender habit, and a sanguineous temperament, was seiz'd with a violent fever, a dry cough, and a pungent pain of the left side; yet if she lay down on the diseas'd side, she felt but little pain. The pain remitted so much from blood-letting, that she could now lie down on any part she pleas'd. Only a fever and thirst were troublesome. She sometimes expectorated a thick matter. Her respiration became more violent. At length, on the thirteenth day she died.

The left lobe of the lungs was entirely unconnected with the pleura, and this membrane was without the least injury; yet the lungs themselves were whitish in their colour, distinguish'd with black points, pretty hard in their flesh, and shew'd some tubercles that abounded with sanies. The left lobe indeed, at its upper part, adher'd to the pleura, but was far less diseas'd than the right, as it was only sprinkl'd over with black spots, and towards the throat was pretty hard, and contain'd a small abscess. In the pericardium was an ounce of serum. In the right ventricle of the heart was a large polypous concretion, which however was, as to the greater part of it, contain'd in the auricle, the cavity whereof it wholly occupied, extending itself from thence into the vessels. In the left ventricle was another, but smaller.

50. But what conjecture shall we make use of here? Why that which the evident, but easily pardonable error of Valsalva, or rather of his pen, supplies us with. For when he describes the lungs, he in neither place mentions the right lobe, but the left in both places: and for this reason it is, I think, allowable for us to suspect that the lobe which he first describ'd, was the right, and that he describ'd secondly, the left. In this manner every circumstance will be easily explain'd. Hitherto I have endeavour'd, in the way of conjecture, to deduce the cause of the pungent pain from the connexion of the pleura and lungs. But there are some histories, in which, besides that connexion, there was also a slight inflammation of the pleura, but no pungent pain, which, nevertheless, most persons have ascrib'd to an inflammation of this membrane. Of that kind, besides another which I shall produce in another place (*g*), are those two that follow.

51. A young man, of more than twenty years of age, who had previously labour'd under a chronic fever, was seiz'd with an acute one, with a pain of

the breast, a difficulty of respiration, a cough, and a slight expectoration of matter, which was ting'd of a bloody hue. This man, on the first days of the disease, for the most part, lay on his left side, and in the last days continually. About the sixteenth day he died. In the abdomen, the spleen was three times larger than its natural size. The left cavity of the thorax was entirely fill'd up by the bulk of its own lungs; so much were they swell'd; universally hard, and inflam'd, and every where annex'd to the pleura: which being only suffus'd with a slight redness, shew'd the beginning of an inflammation. The pericardium was not only fill'd with a humour, like the whey of cows milk, but was also vastly distended, and some concretions of this humour were strew'd here and there, over the surface of the heart. In each of the ventricles of the heart was a polypous concretion, of a very small size, and flaccid; yet that in the right was rather the largest; and larger productions were carry'd from each, into the auricle, and veins, than were carry'd into the arteries.

52. You see this is already the third person, in this one letter (*b*), who had the spleen much enlarg'd after a long fever; and I shall add others also hereafter (*i*). So likewise, you will read in Kramer (*k*), that an infarction of the spleen "is constantly observ'd in Hungary, after every chronic fever, and "especially a quartan;" and not only see that in the bodies of some, "who "died of intermitting fevers, schirrhous spleens" were observ'd by the celebrated Hoyer (*l*). Moreover, it is pointed out by the learn'd Fantonus (*m*), how much more easy it is for patients to fall into a peripneumony, after being attack'd with disorders of that kind in the spleen. Which, as it happen'd to that carman (*n*), and the clergyman (*o*), happen'd also to this young man.

In him, indeed, you see that there was a connexion of the inflam'd lungs with the pleura, and that this membrane, moreover, was not entirely free from inflammation; yet no mention is made of any pungent pain. But if you should set light by the inflammation of the pleura, as being here very slight, at least you will attend to the connexion of the pleura with the lungs, being very considerable. How then is it? The magnitude of this same lobe being so much increas'd, as to fill up the whole cavity entirely, and being also join'd with a hardness of the surface (*p*), was, perhaps, the reason why neither the weight of the lungs, inasmuch as they were supported on all sides, nor the distension from the inspir'd air, inasmuch as the surface did not give way, could cause any uneasiness or pain; and that so much the less, as the magnitude, and hardness of this lobe were still augmented by the progress of the disease. For which reason, the patient lay on the affected side, on the first days of the disease, for the most part, and on the last days, continually.

53. The man-servant of a certain knight, who was five-and-fifty years of age, complain'd of a pain in the middle of his chest: he could only lie upon his back, and a little on the left side. He was oblig'd to breathe with his neck upright. He died on the sixth day.

(*b*) Vid. supra, n. 2. & 30.

(*i*) Epist. 31. n. 2. & epist. 36. n. 17, 18.

(*k*) Vid. Commerc. Litter. A. 1738. Hebd.

15. n. 2.

(*l*) Aët. N. C. Tom. 5. obs. 68.

(*m*) Schol. ad Patris obs. Anat. Med. 27.

(*n*) (*o*) n. supra indic. 2. & 30.

(*p*) Vid. supra, n. 38.

The left lobe of the lungs, towards the back, had grown universally indurated, to a considerable degree, and adher'd strongly to the pleura, which was a little red, even where it invested the diaphragm. The right lobe of the lungs was found; notwithstanding a little serous matter was observ'd in that cavity of the thorax, like pus. In the pericardium was a turbid water. In the right ventricle of the heart, together with a polypous concretion, there was coagulated and grumous blood: yet in other parts, the blood preserv'd some fluidity.

54. This history, as far as relates to our present purpose, is pretty much like the former; and if it is understood by you in a similar manner, both in regard to the observation itself, and the explication of it, I have no occasion to add any thing more.

But, perhaps, you desire to know, whether a pungent pain is troublesome only at that time, when the inflammation of the pleura is complete. I will subjoin two cases of this kind, from the first of which, you will perceive, that this was the case, and from the other that it was not.

55. That man whom I have already sufficiently spoken of, in the third of the *Epistolæ Anatomicæ* (q), as lab'ring under long and various disorders, which related, in general, to the abdomen, and in whom I found the liver much diseas'd, was at length seiz'd with a pungent pain in the left part of the thorax, and a difficulty of lying down upon that side, though he could lie with ease on the other: he had in the beginning also a cough, and expectorated something. But on the tenth day, or thereabout, from the beginning of that pain, the expectoration being suppress'd, he died.

The upper part of the left lobe of the lungs had grown, universally, into a hard tumour, which compress'd the neighb'ring parts, on all sides, being connected also to the pleura, in some places, by slender filaments: and the pleura itself was also inflam'd. But the right lobe of the lungs, although connected strongly to the pleura, in such a manner, that it could be scarcely separated without laceration, was found to be quite free from disease. In the pericardium was a small quantity of water. In the ventricles of the heart were polypous concretions, in the left a very small one, stretch'd out to the great artery, in the right a larger, which reach'd to the vena cava, and the pulmonary artery.

56. A man of about fifty years of age, who had already, for many years, labour'd under a leprosy in the thigh, was seiz'd with an angina. And this lasting two days, terminated in a kind of pain in the back: to which was afterwards added, a dry cough, a great thirst, and a difficulty of lying down on the right side, though he could lie easily on the left; also an oppressive kind of pain, which seem'd to bind the lower part of the thorax, like a girdle. Although the fever seem'd mild on the last days of the disease, and there were no signs beside those I have mention'd, which indicated an inflammation of the thorax, yet the patient died on the ninth day, from the time he had taken to his bed.

The left cavity of the thorax was found to be full of a purulent serum: and from this serum, being concreted, a kind of membranous expansion was

form'd, which adhering to the pleura, look'd like a corruption of this membrane. Yet the pleura, which lay under this stratum of concreted serum, was inflam'd : and the lungs had suffer'd, in some measure, the same inconvenience, though very slightly. But very small polypous concretions lay hid in the great vessels, near the heart.

57. You do not see that any pungent pain is taken notice of in this history, as in the former, although you read that the pleura was also inflam'd in this : and even if you compare it with the lungs, it will appear, that it was affected with an inflammation of such a kind, that the man may seem to have died principally on the score of this inflammation. And the observation is so far extraordinary, on this very account, that I do not remember to have met with any thing similar to it, in the histories that Valsalva has left in writing, or that I have collected. And even Nanni (*r*), having dissected many who died of an inflammation of the thorax, and discover'd the chief injury to have been in the lungs of the rest, found but just one or two, in whom the pleura only was affected with inflammation ; and these were taken off within the space of two days, by the violence of the disease, without any spitting of blood. But by reason of the rareness of this circumstance, and the difficulty of understanding how death could happen from this cause alone, I then doubted, and do still doubt, whether a fever of the most malignant kind, join'd with that inflammation, had not destroy'd these patients, rather than the inflammation itself ; especially as Nanni says, that he had found only a certain part of the pleura to be inflam'd. For if he had seen the whole pleura to be universally inflam'd, from the axillæ quite to the diaphragm, in the manner which happen'd, in one, or two cases, at most, that you see related in the Sepulchretum, from Diemerbroeck (*s*), I should have been somewhat less in doubt on this subject ; although in the former of his cases, there was a suppuration of the pleura besides, and an extravasation of pus into the cavity of the thorax, from an abscess of this membrane ; and in the other, such a cause had preceded, which even of itself is capable of bringing-on speedy death, that is, a great draught of cold small beer in a very hot state of body. But if the observations of Willis, and Riverius, were all read, in any place where they were equally well describ'd, and not pointed out in a word, as they are in the Sepulchretum (*t*), we might then judge how many cases of this kind there are, and know of what nature they are. In our country, without doubt, it would very seldom happen, if any body should at all find, that in those whom an internal inflammation of the thorax has carried off, " the seat of it consisted in the pleura," or that this membrane " was corrupted, and putrefied."

58. But even pleurifies, of such a kind as occur'd to Diemerbroeck so frequently, must needs be very rare amongst us ; for he writes, " That in the dissection of many pleuritic patients (*u*), he had never found a pleurisy " brought on without the pleura being injur'd ; and that in those whose " lungs adher'd to the pleura, he had also seen the lungs themselves to be " affected, at the same time, in the part which was connected to the pleura ;

(*r*) Vid. Comment. de Bonon. Sc. Acad.
Tom. 1. inter Medica.

(*s*) Sect. hac 4. Obs. 14. § 8. & 9.

(*t*) Ibid. § 1. & 4. (*u*) Ibid. § 10.

“ but in others, in whom the lungs were free from the pleura, that the lungs
 “ were not at all affected :---and that it happens to a third, or fourth part,
 “ only, of mankind,” (and not to a third, or fourth part of pleuritic pa-
 tients, as some have understood) that the lungs adhere to the pleura. For
 read all the observations of Valsalva, that I have given you hitherto, which
 are nine-and-twenty in number; read also mine, which I shall send to you in
 a short time, eighteen in number. I open'd the bodies of those persons, who
 had died of an internal inflammation of the thorax, promiscuously, as they
 offer'd. What appearances I met with you will see (x). Valsalva, cer-
 tainly, in five-and-twenty of his cases, as well as in two others besides, which
 will be presently subjoin'd (y), never mention'd any injury of the pleura; and
 even in some, in whom you might have suspected otherwise, expressly ad-
 monish'd us, that the pleura was without any disease. He found an inflam-
 mation of the pleura, indeed, in four of those whom I last wrote of, but in
 these only. And in two of these (z), it was so slight, when compar'd with
 the inflammation of the lungs, which were annex'd to it, that you would
 suppose the disease had been propagated from the lungs to the pleura, rather
 than from the pleura to the lungs. In the third, indeed (a), as likewise in
 the fourth (b), the inflammation was not very slight. But in the first of these
 two, it was most violent in the lungs, although connect'd only in some places
 to the pleura, and that by tender filaments: yet in this man I am at present
 speaking of, no connexion between the lungs and pleura is mention'd, though
 the lungs were not altogether free from inflammation. And if you ask to
 what cause I then attribute his death, I shall accuse neither the lungs nor the
 pleura, but the purulent serum with which one cavity of the thorax was
 fill'd, and that part also, whatever it was, from whence this pus had pro-
 ceeded. For, as Hippocrates (c) teaches us, that “ whosoever is freed from
 “ an angina, (that is to say, “ suddenly,” as Celsus has translated it (d),
 which seems to have happen'd to this patient) “ in these the disorder is
 “ thrown upon the lungs, and they perish in seven days: but if they get
 “ over these seven days, they then have a suppuration,” and that, as Celsus
 says, “ in some part;” I, who see that in a patient who surviv'd the seven
 days, pus has been found, and do not see from what part this pus proceeded,
 although I should willingly accuse the lungs, if the history would permit,
 give you free leave to interpret Hippocrates in such a manner, that when he
 mention'd the lungs, you may suppose he meant to point out the neighb'ring
 parts also, as he was very studious of brevity. But that pain of the back,
 which immediately succeeded to the angina, and the other heavy pain, which
 seem'd to bind the lower part of the thorax, like a girdle, unless you chuse
 to refer the latter to the purulent serum, with which the diaphragm was op-
 press'd, will perhaps supply you with some suspicion, if not some conjecture.
 But leaving these matters quite at large, I will admonish you of this, one
 thing, in the mean while, that in the description set before you (e), you at-

(x) Epist. 21. (y) N. 59, & 61.

(z) N. 51, & 53. (a) N. 55.

(b) N. 56.

(c) S. 5. Aph. 10.

(d) De Medic. l. 2. c. 7.

(e) N. 56.

tend to the false membrane, which, adhering to the pleura, resembl'd a corruption thereof. For the next observation is of the same nature.

59. A woman, in the sixty-fourth year of her age, was seiz'd with a pain in the right part of her thorax, so that she could not lie upon it, but with difficulty, nor touch it, but with pain. Her respiration was frequent, her cough dry, her pulse quick, frequent, small, and weak. On the seventh day, a sweat came on about her head. Her strength failing, she died about the ninth day.

The thorax being open'd, the lungs, in the right cavity, appear'd to be very turgid, so as to fill it up entirely, and to adhere slightly to the pleura, by means of a kind of membrane, as it were, betwixt that and the pleura. But this membrane was, in fact, nothing else but serum, which, after it had issu'd out from the pores of both these parts, had so concreted, and extended itself, that at first sight it resembl'd a membrane turgid with sanies, and even a corrupted pleura. An appearance of which kind, says he, seems to have impos'd upon Riverius (*f*), when he affirms, that he had found the pleura corrupted in a pleurisy. But in this case, by diligent enquiry, the pleura was at length found to be sound; yet the lungs, on their back part, were inflam'd with great hardness. However, the other lobe was, in many places, connected to the pleura, yet, nevertheless, uninjur'd. In the pericardium was much water. In the cavities of the heart many polypous concretions lay hid, a pretty large one in the right auricle, and a lesser one in the adjoin'd ventricle, the first of which was produc'd into the *venæ cavæ*, and the other into the pulmonary artery. There were, also, two less than the last, in the left ventricle, unequal to one another in magnitude: the larger of these extended itself into the great artery, and the lesser into the left auricle.

60. Whether Riverius has blunder'd, or not, and if he has, whether in this way only, I shall not take upon me to determine. For I know, that there may sometimes be another cause of error: and this, when you shall have read the next history, I will declare.

61. A woman, who was more than sixty years of age, of a plethoric habit, and fat, was seiz'd, on the first of December, with a pain in the thorax, particularly on the right side, with a violent fever, great thirst, and a foreness and lassitude of the whole body: nor could she breathe without pain. Blood was taken from her, and other assistances of art were made use of, but in vain. That lassitude was even increas'd, the senses became torpid, and she was in some measure delirious. At length, the spitting, which was before in small quantity, and not glutinous, was thrown up in a round form, and in a state of purulency; respiration became more laborious; a delirium came on; and on the eighteenth day of the disease death itself took place.

The thorax being open'd, while the right lobe of the lungs was separated from the pleura, to which it adher'd, much purulent matter burst forth, that is to say, from an abscess in the substance of the lungs, round which there was a great inflammation; yet the pleura was without injury. The left lobe of the lungs was sound. The right ventricle of the heart contain'd a small

polypous concretion; but the other contain'd only a beginning concretion, of that kind.

62. Now, if you will read over again that which was even written by me on the dissection of a certain virgin spoken of above (*g*), I mean, that while the separation of the lungs from the pleura, to which they adher'd strongly, was attempted with the hand, the lungs were torn asunder, by reason of their rottenness, and that, at the same time, they threw out, from an abscess, a great quantity of sanious matter; you will then easily understand, how liable that is to happen, which I gave an admonition in relation to, fifty years ago, in the Academy of Sciences at Bologna (*b*); and my prince and master, that most beneficent patron of letters, which he himself greatly adorn'd, Benedict the Fourteenth, Pontifex Maximus, did not think this admonition unworthy to be made a favorable mention of, in his immortal books (*i*). For suppose that some, as I have more than once seen, even celebrated physicians among the populace, who were much practis'd in visiting patients, and but little, or not at all, exercis'd in inspecting bodies after death, were present at the dissection of a man, who died not without signs of a pleurisy, which was perform'd, as frequently happens, by an inexperience'd surgeon; and as he endeavours to remove the lungs from the pleura, the same thing happens which happen'd in this woman (*k*), or in that virgin (*l*), that from an abscess, suddenly bursting in that part of the lungs which adheres closely to the pleura, pus is effus'd, but that the remainder of the pus, and the lacerated remains of the lungs, which are annex'd to the pleura, continue still to adhere, as they generally do, while the other part of the lungs, immediately collapsing on the discharge of the pus, contract the cavity of the abscess, and almost conceal it, or if it shew it at all, seems rather to shew the effect, and a part of a certain neighb'ring tumour, suppurated in the pleura; I would not have you doubt, but it would immediately be pronounc'd, that they had enquir'd sufficiently, that they had evidently seen the pleura putresc'd, and corrupted, flowing with collected pus, and leaving no suspicion of an error from the pre-judg'd opinion. But this error might have been very easily avoided, where those remaining parts being clear'd away, by the hand of a cautious and diligent dissector, the pleura had been found, underneath them, to be but slightly affected, or even, as happen'd to Valsalva (*m*), entirely sound, and altogether without injury, when laid bare.

I do not, however, for these reasons, deny, but a great injury of the pleura itself may sometimes have been met with, by skilful and practical anatomists, after internal inflammations of the thorax. I only take the liberty to declare, what I suspect of the observations, so much boasted of among the less expert.

Now, because I have observ'd, that by most of them who labour to assert the seat of these inflammations to be the pleura, and to take it away from the lungs, almost all sensation is denied to this viscus, I will subjoin one observation, and no more, from Valsalva, and that a very short one too, by which the contrary may be affirm'd.

(*g*) N. 11.

(*b*) Vid. ejus Comment. loco cit. supra, ad n. 57.

(*i*) De Servor. Dei Beatific. l. 4. P. 1. c. 18.

(*k*) N. 61. (*l*) N. 11.

(*m*) N. 61.

63. An old woman, of seventy years of age, complain'd about two months of an internal pain of the thorax. She had no cough: she expectorated nothing: she could lie down on neither side. At length, she died.

Both lobes of the lungs were distinguish'd with black spots: and the right, besides this, was on its back-part, towards the vertebræ, hard and ulcerated, although no sanious matter appear'd. A polypus, of a considerable size, was found in the right ventricle of the heart, which was produc'd from thence, through both the orifices of that cavity, into the vessels, and the branches of the vessels, and by its bulk had much dilated the right auricle.

64. If you conceive how the polypus, or rather the polypous concretion; since even those were not the marks of a polypus, which are commonly produc'd, nor yet of the dilated auricle; or rather, I say, the polypous concretion, which Valsalva was accusom'd, at that time, to use the name of polypus for; was form'd in the last moments of life, in the same manner as you do those black spots of the lungs (*n*), and that the auricle was of itself lax, and for that reason, easily dilated by the polypous concretion, inasmuch as it was too infirm in its coats, to resist the distension; it then remains only, that the internal pain of the thorax must have had its seat, for two months, in no other part but in the ulcerated lungs.

65. Now, as you have a very long series of Valsalva's observations; for I have given you one and thirty, before this last; if you should happen to enquire, in which side of the thorax, the inflammation happens most frequently, you will find that it happen'd quite differently with him, from what it did to those very learned men, who have said that the right side was, for the most part, affected therewith, and the left more seldom. For setting aside the bodies, in which Valsalva found both sides inflam'd, you will see, that out of the remaining cases, almost as many had an inflammation on the left, as on the right side: and you will learn nearly the same also, from my two and twenty observations, which I shall send to you speedily.

But you will say, that this assertion has been made in regard to the inflammation of the lungs only, and not of the conjoin'd inflammation of the lungs and pleura. Yet you will not find, that the observations of Valsalva agree with them, even on this supposition. And as four of these, and no more, give a history of both inflammations being join'd together (*e*), so in every one of these, the disorder was on the left side. But if one of mine agrees with them (*p*), another does not agree very well (*q*). It seems, therefore, that a greater series of observations is requir'd, in order to determine any thing certainly on this head, or in order to undertake to explain from anatomy, why a pleurisy is more frequent on the right side, but more mild. And you will then judge, whether the illustration of this problem, which has been giv'n by excellent men, with no less modesty, than ingenuity, may be farther carry'd on, and perfected by anatomy, when it shall seem less premature. In the mean while farewell.

(*n*) Vid. epist. 24.

(*e*) n. 51, 53, 55, 56.

(*p*) Epist. 21. n. 33.

(*q*) Ibid. n. 34.

LETTER the TWENTY-FIRST

Finishes the Discourse of pain in the Breast, Sides, and Back.

AS I am about to write my observations to you, nearly in the same order that I wrote Valsalva's, I will begin with those, in which the internal inflammation of the thorax had its seat in the lungs, without the pleura being at all affected.

2. A woman died of a peripneumony, not without inequalities of the pulse, in the hospital of St. Mary de Morte, at Bologna, in the month of March, and in the year 1706: at which time, Valsalva being sent for to Parma, I dissected the bodies in the anatomical theatre, in his stead.

The lungs had a compact substance, like that of the liver: and the pericardium contain'd a great quantity of water. The external surface of the heart seem'd, at first sight, to be corroded in a great part of it: and yet was not so; but unequal concretions adhering to it gave it this false appearance: and these concretions, being easily remov'd, the external membrane of the heart appear'd smooth and entire (*a*). Other concretions also, adher'd to the internal surface of the pericardium, which were entirely disjoin'd from the former, yet of the same kind; so that you would readily conjecture both of them to have been form'd in the same manner, of the grosser particles, which had separated from that water, and coalesc'd. In the ventricles of the heart, and the right auricle, were large, white, polypous concretions, but they had not any very firm consistence. In the *vesicula fellis* were two black calculi, of a pretty hard texture, approaching to the form of a cube, and of an unequal magnitude; but neither of them small.

3. A stout muscular young man, of eighteen years of age, being taken off, at Venice, by a peripneumony, within eight days; some learn'd men, among my friends, requested of me, that I would go through the dissection of his body, it being now the month of December, in the year 1708: and that more for the sake of knowing the natural state of things, and examining them with care, than those appearances which related to the disease. However, I demonstrated the following things in relation thereto.

The right lobe of the lungs adher'd, all round, to the neighbouring parts, by a kind of thin membrane. The upper lobule of the same lobe was extremely hard, and heavy; that is, of a substance resembling the liver, which appearance the remaining part of the lobe also, had, in some measure, and the greater part of the left. In the left cavity of the thorax, was a great

(*a*) Vid. *epist.* 25. n. 24.

quantity of water, and that bloody, and of a blackish kind of hue : and the same kind of water was also in the pericardium, in considerable quantity. The right auricle of the heart was extremely dilated, with a great quantity of blood, by easily yielding, as I suppos'd, to the quantities thrown into it, in the last moments of life, and stagnating there. This blood was black and grumous, and contain'd a tough polypous concretion, of a large size, part of which reach'd into the ventricle beneath : there was another in the pulmonary artery, of a substance not unlike the former, but round. Yet there was none in the left ventricle, and its adjoining auricle, for in these cavities, there was not even the least blood of any kind, unless it had flow'd out in dissection. In the abdomen was some quantity of water ; the liver was livid at its edge : and the intestines, being in some places reddish, had a very strong smell.

4. An old man of seventy-four years of age, of a low stature, and us'd to frequent victualling-houses, having been liable, for some years past, to an inflammation of the lungs, was at length carried off by it in the hospital at Padua. There was nobody, at that time, who could accurately relate the peculiar symptoms, that had been observ'd in him : wherefore I do not enumerate them, as I did not likewise, in the two former histories, for the same reason. I will not, however, conceal this one thing, which I could learn for a certainty. He had labour'd under no symptom at all, that particularly related to any disorder of the heart, no deliquiæ, no palpitations, no inequalities of the pulse, which was in other respects small, nor any other symptoms of that kind. For I enquir'd diligently into these things, after having made use of the body, for public demonstration, in the year 1730.

The lungs were universally annex'd to the pleura. The upper part of the right lobe was hard, and blackish : and the sanguiferous vessels, of the same lobe, were very closely connected with the bronchia ; and among these vessels, was observ'd one, which was dilated to the extent of some inches ; but when this tract was measur'd over, it then return'd to its just diameter. I also saw the trunk of the bronchial artery arise from the aorta, of an unusual bigness, so as to be, nearly by three times the diameter, larger than it generally is. And on the posterior surface of the left ventricle of the heart, at about the space of two fingers breadth above the apex, a tubercle was prominent outwards, of the bigness and shape of a small cherry, one half of which rose above the surface, and the other half buried itself within the substance of the heart. It was pretty much like one of those hydatids, which are form'd within the other viscera, the lungs for instance, or the kidneys, in such a manner, that they are still prominent in some measure. When it was prick'd with the knife, it emitted a little water ; yet still retain'd a more turbid humour. But this turbid humour was also discharg'd from the cavity, when laid quite open, together with a small membrane, in which were some white and mucous particles as it were, and also a particle of a tendineous hardness. This little membrane seem'd to obtain the place of inner coat in the tubercle ; for the external was another membrane of a dense nature, and whitish, internally rough and unequal, girt round the whole tubercle ; so that it seem'd to be in some measure referable to those tumours, which, as Celsus

(b) says,

(b) says, “arise from small beginnings, increase for a long time, and gradually, and are included in a proper coat”. And while I was separating this coat from the flesh that lay about it, I found it found, and that not only round about, but where it pass’d between the tubercle and the cavity of the ventricle; for the tubercle did not extend itself much beyond half the thickness of the fleshy paries, in which it had been form’d. Finally, the left auricle of the heart was much longer than it us’d to be, and on the internal surface of the aorta, frequent bony scales were seen, especially at the curvature, and near the heart, with this exception however, that behind the femilunar valves beginnings of them only appear’d. Yet some of them were not wanting, even in other places, and particularly at the orifice of the coeliac artery.

5. In regard to the tubercle of the heart, I will here first say, what I said, when I demonstrat’d it to my auditors, that it might be perceiv’d from this observation, that the following words of Pliny (c) do not sufficiently agree with the truth: “This alone of all the viscera” (that is, the heart) “is not consum’d by diseases, nor lingers under the afflictions of life: for when it is once injur’d, death is immediately the consequence.” I now add: Neither does the general opinion, that the heart cannot be injur’d, without some or many of those symptoms, which I have said did not take place in this old man, sufficiently coincide with the truth. And what the symptoms were in the observation of our Veslingius, which was more rare indeed, on account of its situation, and yet belong’d to the same species as mine, Rhodius, who describ’d the observation (d), has neglected particularly to inform us. For as far as it is certain, that what was taken out of the right auricle of the heart, was not any thing polypous (although in regard to some other observations I doubt) but a true “follicle, in which there was no pus”, inasmuch as “it had small veins annex’d to it, for nutrition;” so far also, it is evident, that the dropsy, and the pus discharg’d in the beginning of the disorder, could not be esteem’d as peculiar symptoms of this degeneracy in the heart.

But, to return to what relates to the present purpose, is the beginning, and encrease, of that tubercle to be imputed to the inflammations of the lungs, which our old man had been subject to? For you have seen in the former letter, and even from the dissection produc’d in this also, how frequently serum is accumulated in the pericardium, at the time of a peripneumony, and that very thick, and loaded with heterogeneous particles, which, by being separated, may adhere to the heart, or be injurious in some other way, even after the inflammation is at an end. And you will even see what I shall slightly observe below (e), in regard to several persons who have had their hearts dilated, from an inflammation of the lungs: and from thence may conjecture, that as an impetus had, in this case, been very evidently made upon the left auricle, so also, that an impetus might have been made upon the substance of the subjected ventricle, though not in so evident a manner. But these circumstances, at least, may be ascrib’d to the foregoing peripneumony; that the bronchial artery was much thicker, that some one of the vessels that attend upon the bronchia was varicose, that these vessels coher’d, much more closely than usual, to the bronchia, and perhaps even that the lungs had every where coalesc’d with the pleura. For the cir-

(b) De Medic. l. 7. c. 3.

(c) Nat. Hist. l. 11. c. 37.

(d) Cent. 3. Obs. Med. 4.

(e) n. 34.

culatation of the blood being retarded through the lungs, by frequent inflammations, and indeed in part obstructed, it must of course happen, that the vessels, and the lungs themselves, would be distended; and for this reason, that the first would apply themselves, very closely, to the bronchia, and the last to the pleura; and that the particles, which were press'd out from the blood, that was then of itself viscid, and made still more so by stagnation, would join one part to another like glue. But why more humours still, and more viscid humours, are press'd out at such a time, so that besides the lungs, other parts in like manner, even those of the belly, are often seiz'd with inflammation, and other circumstances of the like kind, as they have been sufficiently explain'd in the foregoing letter (*f*); do not expect me to repeat the explanations here: and for the same reason it was, that to the two histories describ'd before this, I subjoin'd no remark at all. But that in these three observations I have not related the symptoms particularly, which had accompanied the peripneumony, is not owing to my carelessness in enquiring or describing, but to the neglect of those who had seen the patients: although there are sometimes causes, on the account of which, even they themselves who visit the patients, cannot be sufficient judges of the greater part, or at least of some, of the signs, that attend upon disorders. I will here give you a particular history, in order to elucidate each of these causes, as I produce them, beginning with a dissection which I perform'd at Bologna, in the same days, and on the same occasion, in which I perform'd the first (*g*).

6. A builder, or, as they are commonly call'd, a mason, of about thirty years of age, was seiz'd with a fever after great labour. To this were added daily periodical rigors, at the time of which he at length began to be delirious. But when the delirium, which us'd to be soon over every day, at last became continual, the patient immediately grew worse and worse. It was a melancholy and plaintive delirium: the pulse was equal: blood sometimes came forth from the nostrils. Although a vein had been open'd once and again, and other things, which were suppos'd to be advantageous to the patient, were not omitted, yet he grew continually worse, though gradually, till at length he died. The viscera of the body, when dissected, though at the distance of nine hours after death, were even then warm and smoking: and the blood issu'd from their veins, when incis'd, in a fluid and warm state; notwithstanding polypous concretions were afterwards drawn out, not only from the crural veins, but also from the heart, from whence they were produc'd into the pulmonary vessels, on one side at least. The lungs, if you except the anterior part, which was whitish and sound, were almost every where harder than the natural state; but on the right side, and especially in the superior lobe, were very hard, very heavy, distended, red, and made up of a dense and compacted substance. In the belly was a large spleen.

7. What symptoms of a peripneumony can you properly learn from a patient, when it has succeeded a delirium, especially those that relate to the nature, and situation of the pain? And both these disorders may be easily join'd together, as the great number of examples pointed out, and produc'd, in the seventh, and the former letters, demonstrate, not only on account of the

(*f*) n. 34, 37, 44.

(*g*) n. 2.

polypous

polypous particles of the blood being prone to stagnation, but also because the delirious patient forgets frequently, and for a long time, to draw his breath, and for that reason to propel the blood through the lungs: and the peripneumonic patient, having the circulation of the blood through the lungs not so free as usual, must of course have an obstruction to the quick return of it from other parts; I add, from the upper parts in particular, when the superior vena cava is press'd by the distended lungs, as in the present case of the mason. For which reason, we see that the upper parts often grow externally red, and turgid in this disease; so that it is easy, from thence, to conceive what may happen to the internal parts also, or, at least, may be in danger of happening. From being appriz'd of these circumstances, it was that I was less surpriz'd, when, upon teaching the anatomy of the brain publicly, at different times, but especially in the year 1730, there was not one of the heads that I had open'd, in which the vessels of the brain were not distended with blood; for it had accidentally happen'd, that all of them had been taken from bodies of persons who had died of a peripneumony, which was frequent at that time: nor was extravasated water wanting in the brain of each of them, just as we often see it extravasated in the thorax of peripneumonic patients, in like manner. But on this subject you will read over again the seventh letter; for I will not repeat here what has been said relative thereto in that epistle, and especially under number eleven and twelve.

8. There is, also, another cause, why patients sometimes perceive no uneasiness from the inflam'd lungs; I mean, a dullness of sensation, either by reason of the laxity of the brain, or of the nerves, the lungs, or the annex'd pleura. And you have an example of its being from the brain and nerves, in two old men, one of whose histories I describ'd in the sixth (*b*), and the other in the eleventh letter (*i*). Both of them had an inflammation of the lungs. But one of them, being half asleep, and slow of understanding, denied his having any uneasiness in the thorax, even at the time when he ought most to have perceiv'd it. And the other being hemiplegic from an apoplexy, and having no sensation in the whole right side of his body, it is not to be wonder'd at, if he had no sense of the lungs being inflam'd on that same side. It remains, then, only to shew, by example, that the same thing may happen from the laxity of the lungs, or the annex'd pleura.

9. A husbandman, who was thirty-five years of age, having fall'n from a great height, and bruise'd his right side, was receiv'd into the hospital of St. Mary de Morte at Bologna. This man, after having recover'd by a proper method of cure, and being quite well in regard to his respiration, and other circumstances, so that he was about to be dismiss'd from the hospital, began to cram himself, privately, with bread, and other viscid aliments, to such a degree, that he fell into an ardent fever, and soon after into a difficulty of breathing, which was, however, attended with no pain in the chest. Such remedies were administer'd, as the disorder seem'd to require, among which was blood-letting, once or twice. But all were to no purpose. For lying on his back, as his custom was, and having a stertor, and his pulse being chord-

(*b*) N. 12.(*i*) N. 13.

like, and very frequent, which had been before large, he died within eight days after the ardent fever had attack'd him, having dragg'd on the last days of his existence, under the oppression of such symptoms. This happen'd about the middle of April, in the year 1706.

I dissected the body on the day following, in which I first saw a laudable habit; but the face and neck were livid, as in hang'd persons. The abdomen was also livid, not only at the ilia, but also very far about the middle of it. The lungs every-where adher'd to the pleura, not only by means of membranes, but immediately, and by themselves, as it seem'd at first. Yet if you attended to it more nicely, betwixt the membrane of the lungs, which was sound, and the pleura, a thin concretion was interpos'd, in such a manner, as to resemble another membrane. With this, when you pull'd away the lungs, the pleura itself follow'd readily. The inferior lobe of the lungs was very large, and heavy, in its whole substance much harden'd, and resembling the substance of the liver. The remaining parts of the lungs were not to be found fault with. In the pericardium was a large quantity of yellowish and turbid water. In each of the orifices of the heart, and its auricles, were polypous concretions; and among these, the greatest was in the right auricle, which sent branches from thence quite into the jugular veins. In the belly, the large intestines appear'd more conspicuous than the rest, being turgid with air. But the lower parts of the ileum deserv'd our attention more, which were, to a considerable extent, every-where of a blackish red colour, the sanguiferous vessels being very manifest, just as if they had been injected with a colour'd wax: and there was a strong smell, such as is common to inflam'd intestines. The liver was whitish, except that it was livid at its border, and internally variegated like marble. The gall-bladder had but little bile, nor was it altogether natural. The spleen was large, whitish, and very lax.

10. If you acknowledge the pleura, which easily follow'd the adhering lungs, when separated from them, to have been lax, you may, I think, from thence learn, why the weight of the inflam'd lungs was not felt thereby.

However, notwithstanding I think that this, and other causes besides, may be sometimes produc'd, and not without probability neither, why some peripneumonic patients do not perceive the weight of the lungs, when it is so greatly increas'd; yet I confess, that in some of them, I do not see the cause of this circumstance, which can sufficiently satisfy me, and still less why the other signs of this disease are also wanting in part; and in part so slight and obscure, that when inevitable death is now at hand, the disease is with difficulty known by the physicians, and sometimes not at all even then, but only after dissection.

You perceive that I speak of a thing of the greatest moment, the signs and marks of which ought to be inquir'd into, and trac'd out with the greatest exactness and care; so that whenever it happens, we may have it in our power to know it, and obviate it sufficiently in time. And I wish Valsalva, from whom I heard the first mention of this circumstance, had taken notice of it, also, in his papers, and had mark'd it out by some signs. But whether, on account of the rarity of the cases, he had not opportunity of observing it, unless in patients who were already desperate, or whether he did really make observations, but in the last part of his life, when he was so continually taken

up in his profession, that he had no time to commit any thing of that kind to writing; be this as it will, I could, at least, find nothing at all in his papers relative thereto. For which reason, I shall communicate what I have heard from him, and what I have myself seen, beginning with a short history, part of which, as far as it relates to the disease, was told me by Valsalva; but as to what relates to the dissection, that I saw myself, as I assisted him in the examination of the body.

11. Francesco Coralli, a native of Bologna, being an old man, was troubled with a catarrhus disorder, as men of his age generally are, but so slight in appearance, that he did not think it worth while to send for a physician to take care of it. It, therefore, happen'd accidentally, that, as he intended going out of his house, on the day following, and this seem'd too early to his domestics, Valsalva was desir'd by them to call, as it lay in his way, upon their master, who was familiarly known to him, that he might dissuade him from so rash a design. He came, therefore, on that day in the morning, and observ'd those symptoms, which, when observ'd, had signified to him, in other cases of the same kind, that death was near at hand, contrary to the opinion of those who were about the patient. Wherefore, calling aside his domestics, who suspected no such thing, he immediately told them what was at hand, and affirm'd, that although the patient felt no heavy pain in his chest, nor yet any of the pungent kind, and even seem'd to himself to be pretty well, he had, nevertheless, an inflammation of the lungs, which was already desperate. The event confirm'd the prediction; for within twelve hours, or sooner than that, death came on. And the knowledge of the disease was confirm'd by the dissection of the body. For when the thorax was open'd, we found the upper lobe of the lungs, on the right side, tumid, hard, and stuff'd up with blood.

12. I do not doubt but you will here ask two things; one, in what manner Valsalva explain'd the circumstance? and the other, by what signs he was influenc'd to make this diagnostic and prediction? As to what relates to the first, when I express'd my surprize, how it could happen, that the weight of the infarcted lungs was not felt, I do not remember that he made any other answer, except what gave me equal surprize, to wit, that he had known, that a leaden bullet, weighing two ounces, discharg'd from a musquet, had stuck in the lungs, and had occasion'd no sense of its weight.

But in regard to those signs, or marks, as I have mention'd what were absent in the history, so I should not have omitted those which were present, if Valsalva had, in like manner, related them. But as he was silent on this head, and I hop'd that he would publish them of his own accord, I did not care to seem troublesome at that time, by repeated interrogations. However, chance has, I believe, given me occasion to conjecture what these signs were, from what I observ'd here in the celebrated professor Anthony Vallisneri, in the year 1730, who, to my very great grief and affliction, was, I think, snatch'd away by the same kind of disease.

13. In that epidemic constitution of catarrhus fevers, which I describ'd to you in the thirteenth letter (*k*), he was seiz'd with the common disease, on

the twelfth of January, a fever which had been to all slight and salutary ; and to him in appearance slight also, but mortal, either because his lungs were more lax, or because viscid matter then abounded in great quantity, or, finally, because, although he was sixty-nine years of age, yet of a robust constitution, and unus'd to illness, he somewhat despis'd the disorder in the beginning, and even more than once, in the advanc'd state of it, likewise. And, indeed, it was such a disorder seemingly, as might be despis'd. For to omit other things, which I heard from two physicians who had seen him on the second day, the one a little before noon, and the other in the evening, that there was scarcely any symptom of fever in the pulse, and even that they were less quick in the evening than in the morning, I will relate nothing else to you, but what I saw and found myself. When I came, on the fourth day, to congratulate him, as one that was recovering, and found him sitting up in bed, after taking food, I perceiv'd that his face, respiration, strength of voice, and other circumstances of that kind, which may have a judgment form'd of them by seeing and hearing, were all just as they are us'd to appear in health. Then said he to me with his usual complaisance, you see what kind of a disorder mine was ; so that I need not make any apology to you for not calling you in to my assistance on this account. While I sat by him, he cough'd sometimes. I examin'd the matter he spat up, and found that it was well concocted, and saw that he brought it up with ease. He shew'd me his tongue: it was somewhat viscid and white. He stretch'd out his arms: the muscles were like those of a healthy man, his pulse equal, and of a moderate fullness, and strength, having a proper interval betwixt each stroke, except that it was rather somewhat longer, so as to incline to slowness. This was, as I said, on the fourth day of the disease. The day after, I sent a person to salute him in my name ; and word was brought me that he was still more chearful, so that he was dictating a letter to a friend, as he sat up in bed. On the sixth day, though I was extremely taken up with the public business of the college, yet in the morning I was determin'd to go and see my friend, as I pass'd by him. But I found him in a far different state, on this visit, from that in which he had been three days before. His face was discolour'd, melancholy, and down-cast ; his respiration difficult ; his voice was low, and languid, and seem'd to ascend, as it were, from a deep and hollow place ; his expectorated matter was altogether very little in quantity, somewhat crude, and ting'd here and there with blood, which was of a dirty colour.

So great a change immediately struck me, and that so much the more, when upon asking him how he found himself, and why he sat up thus in bed, at those hours ; for it was two hours before noon, and the weather was very cold, he answer'd, that he was much as he had been two days before, when I saw him, or even rather better. I then ask'd him, if he felt any sense of weight, or any pain, or heat in his breast : but he expressly deny'd that he felt any. He only added this, that he felt such an uneasiness in the left side of his breast externally, which all are wont to feel from a cough, and for this reason he paid no regard to it : that he was troubld with thirst, as he had also often been on the former days ; but lest I should suspect that any internal heat was perceiv'd by him, for that reason, he said that the seat of his

his thirst was so far from being in the viscera, that whatever watry fluids he forc'd himself to drink, he found were rejected by the stomach: that the seat of it was not below the fauces; for that these were beset with a viscid matter, by which the taste of whatever food he took was obtunded, and of the wine also, of which he said he had taken a little quantity the day before, as being suitable to a disorder arising from a viscid matter. Although his senses, as you perceive from this discourse, which, however, he did not speak just in the chain I have related it, and without intermission, were in perfect vigour; although his tongue, flesh, pulse, except that this was less strong than it had been, were just the same as on the fourth day; and though he affirm'd his urine, which I did not see, to have been always good, and to be still so; yet I was so far more and more displeas'd, almost every moment, with his respiration, voice and countenance, not to mention the quality of the expectorated matter, and the diminution of it, that I could not help betraying my grief in my countenance, though I study'd to conceal it. Then said he to me, Why do you hesitate? we must confide in this pulse; and touch'd his wrist with his fingers. But as I was not ignorant of the deceitful nature of some diseases, and as I bore in mind the case of Coralli (*l*), these very things made my fears more certain, because he was not sensible of so great a disorder, and because other circumstances did not agree with so many bad symptoms, as, among the rest, the pulse, and the urine, in particular: for why was the pulse, in this case, not quick, but rather sluggish? I ask'd him, therefore, whether, when he was in health, he us'd to have rather a slow pulse? To which he answer'd no; and added, that from the age of sixty, as generally happens to old men, he had begun to have an intermitting pulse, but that those intermissions had ceas'd for some days past, which, without doubt, was a proof of some greater impetus being excited. This one circumstance, and the thirst, were the only marks of any fever, that I found in the disease; when it had proceeded so far, that within twenty-four hours, from the time I refer to, it took off this worthy man, who deserv'd to have liv'd to a much longer period.

14. Do not be surpriz'd if you have any thing related by me, here, a little differently from what it is related in his life. For his most familiar friends, and physicians, besides his most tender wife, and belov'd children, were seiz'd in the mean while, one after another, with the epidemical fever, so that being all confin'd to their beds, on those last days, they could not send a sufficiently compleat account of what I saw, and observ'd, at that time, to the very ingenuous and learn'd writer. In this state of things, I took pains that other physicians, and those the most experienc'd, should be call'd to him immediately, if they should, perhaps, think differently from me, and this most deserving patient might yet be sav'd by any assistance of art. And I would to God I had been deceiv'd. But the catastrophe was now coming on, and every symptom continu'd to grow worse and worse, very evidently, and very hastily, his countenance being grown entirely cadaverous, his respiration more difficult, and expectoration being at length entirely suppress'd. Yet he himself, such was the deceitful nature of the disease, answer'd to one

(*l*) *supra*, n. 11.

of his physicians, who return'd in the evening, and ask'd him how he did, that he was better. And although he was troubl'd all the night with a ster-tor, and a great difficulty of breathing, yet it was not till the morning, and a very few hours before his death, when his pulse was become low and quick, that he, at length, found his own disorder had impos'd upon him, and, according to his custom, ingenuously confess'd it, to those who were present. And from those persons it was that I learn'd these circumstances: for, from the time that I foresaw the inevitable, and even almost immediate, loss of my most friendly colleague, my grief would not suffer me to be present. And much less should I have been present at the opening of the body, if it had been open'd; although, indeed, there was no doubt with me, and with the other most learn'd physicians, who visited him after me, but that he was taken off by an inflammation of the lungs, which was so much the more dangerous, as it crept on the more latently, and insidiously; so that when it, at length, discover'd itself to us, it was out of our power to cure it.

And for these reasons, the signs of this most treacherous disease, as often as ever it shall happen, ought to be more accurately remark'd, if any one symptom could be possibly found to attend constantly, or at least frequently, upon this disease, at the very time when it begins in the most occult state. For although those symptoms, which accompany it after it is quite confirm'd, are not without their advantage, and that not only to prevent us from being deceiv'd by the confidence of the patient, and some signs that are not bad, but also to enable us to predict the danger when at hand; yet it is much more advantageous to distinguish the latent mischief, which must be destructive unless immediately overcome, and counteract the very beginnings of the disease.

But perhaps it may now come into your head to suspect, that the very symptoms which I enquire after, have been already observ'd, and propos'd by Sydenham (*m*), and Boerhaave (*n*), where they have describ'd that disorder, which both of them call the *peripneumonia notba*.

But if you compare, with a little more attention, the description of these things which they have seen, and what I saw in Vallisneri, you will doubt very much, whether they belong to one and the same disease: although, indeed, they do not quite agree with one another. For as to the vomiting of all fluids, the turbid, and intensely red urine, the pain of the head, excited by the cough to such a degree that the head seems ready to fly into pieces, and in like manner, a pain in the whole thorax, and some other symptoms, which Sydenham proposes, they are not once mention'd by Boerhaave: and he even hints that there is scarcely any thing to be seen in the urine, that can give us any apprehensions. On the other hand he teaches, that from the very beginning of the disease almost all motions, or acts of the mind, are at a stand, that is, as it is interpreted by a very celebrated man, who was acquainted with Boerhaave's meaning, that there was an unusual dullness, or stupidity, while patients of this kind feel scarcely any influence of the passions, and that the internal and external senses were torpid: which you find

(*m*) Obs. circa morb. Acut. hist. f. 6. c. 4.

(*n*) Aphor. de cogn. & cur. morb. § 867. & seqq.

nothing of in Sydenham. But it is agreed betwixt both of them, that if those who are of a pretty full habit, and grofs, or if pituitous, cold, and catarrhus persons are improperly addicted to the use of spirituous liquors, and especially of spirit of wine, or to drunkenness, especially with liquors that are strongly heating, these persons are seiz'd with this disorder, more readily than others: that they are sometimes hot, and sometimes cold, or affected with wand'ring shiverings: that they are short of breath, or draw it frequently, and speedily: that an oppression of the breast, or coarctation of the lungs, is not wanting: nor another symptom or two, which I shall consider presently.

Now if you compare those things, in which these two very skilful physicians agree, and in which they differ from one another, with those that I have describ'd, and know, moreover, that Vallisneri was of a good complexion, by no means of a lax habit, and had us'd a very proper medium in regard to meats, and drinks; you will easily perceive, how much his disorder must be different from what they have describ'd.

But you will say, that it agreed in this circumstance, I mean, that the symptoms of heat, or fever, scarcely admonish'd us of the danger, as in his pulse, and urine, there was scarcely any presage. And I confess it did agree: although Sydenham says nothing at all of the danger of unexpected death: and confesses besides; that there are almost no symptoms of a fever, especially in those who are of a pretty full habit of body, and affected with this disease; yet in that place where he teaches how to distinguish the peripneumonia notha from the dry asthma, he says, that in this spurious disease, manifest signs of a fever, and inflammation, discover themselves, notwithstanding they are far less, and more obscure, than in a true peripneumony. But suppose that both of the writers agree entirely one with another, in these circumstances also; yet we said that marks were to be sought for, by which, if the same disorder that carried off Vallisneri in so insidious a manner, should again fall under our notice, we might very early, or at least in the middle of its course, foresee the pernicious exit of it: and whether we can foresee this, by what they have deliver'd as signs, must now sufficiently appear to you. For there are many disorders that are deceitful from the beginning; but different disorders are known by different tokens. Thus, not to recede from inflammation of the lungs, you may see from what is describ'd by the celebrated Jo. Gesner (*o*), with how fallacious an appearance it has begun, and with how fatal an event it has terminated. But peculiar marks were not wanting, which sufficiently shew'd the deceitfulness of these appearances. And if the description of the disease, which suddenly snatch'd away Wilh. Huld. Waldschmid (*p*), after some slight uneasinesses of the catarrhus kind, from the republic of phyfic, almost at the same time of year, that Vallisneri was taken off, but in the following year, was not unknown to us; we should certainly read of some other symptoms than what we have seen in Vallisneri. For the disease was even in the judgment, and sensation of the patient also, so slight, that he continu'd to visit his patients even to the last day: on which

(*o*) *Commerc. Litter. A.* 1743. Hebd. 8. (*p*) *Eod. Commerc. A.* 1731. Specim. 25.
n. 1. n. 2.

very day, having risen from bed, very brisk and full of spirits, he was soon after forc'd to lie down, on account of a great languor, and debility, which, to that time, had neither been perceiv'd by him, nor observ'd by his domestics, and not many hours after, the physicians in vain acknowledging the greatness of the danger, he clos'd his eyes in death.

However, when I consider by what symptoms the disorder of Vallisneri, or another much of the same nature with that, might be known in the beginning, it seems to me that this question, for example's sake, might be ask'd, from what I observ'd in him on the fourth day, and what I said had been observ'd, even on the second day; I mean, whether if any one, together with the other symptoms of a catarrhus fever, have not the pulse more, or less frequent, but rather more rare than he is us'd to have in health; I say, whether in him, an inflammation of the lungs of that kind, may not presently discover itself. It is certainly worthy of observation, that even after the disorder had discover'd itself, the pulse was even then more rare. Add to this, that in the suffocating catarrh, also, describ'd by Schneider (*g*), and Etmuller (*r*), a slow pulse is propos'd as one of the symptoms: and although this catarrh is not to be confounded with the disorder that I have describ'd, as even the rest of its marks sufficiently shew; yet it is said by each author, that the disorder is brought on, when the blood, especially if it is pituitous, or somewhat viscid, or by any means render'd thicker than usual, stagnates in the lungs. But you will judge better of these things, for as yet I determine nothing. I only say this, that according to the various disposition of the blood, the body, and of the lungs in particular, and the different manner, in which a congestion of blood happens therein, it is probable, the symptoms are varied; so that sometimes, all the chief symptoms of an inflammation, or at least most of them occur, and that this happens for the most part; but that sometimes scarcely any of the genuine signs appear, and those that do appear are contrary, as when the pulse is slow; and finally, that sometimes no marks appear at all, yet the pulse is more or less quick, as in that history which I shall immediately subjoin.

15. An old man of ninety, who had lain in this hospital some time, on account of a contus'd thigh, being at length seiz'd with a slight fever, no external cause, and no remarkable symptoms of which appear'd, died within a few days, having gone off gradually, and slowly, his pulse having been pretty quick, and weak, but without any intermission. And this happen'd about the end of November, in the year 1741.

In both the cavities of the thorax was a reddish water, but not in great quantity. The left lobe of the lungs adher'd, in some places, to the pleura, which was in every part entirely without injury; but the right lobe adher'd scarcely in any place. Yet this lobe, in its lower lobule, was tumid, and hard, from inflammation. The heart was almost universally cover'd with fat, on its anterior surface, in this old man, who was in other respects very lean. Though in the dissection, I had found all the valves, belonging to the orifices of the right ventricle, not only not rigid, nor thicken'd, but even, like those which belong to the pulmonary artery, they had seem'd, rather, to

(*g*) De Catarrh. &c. l. 5. S. 2. c. 4.

(*r*) Prax. l. 1. S. 14. c. 3. art. 4.

be form'd of a thinner membrane than usual; nevertheless, when I came to the other ventricle, the mitral valves were found to be thicker than they ought to be, and the femilunar valves were, moreover, all bony in the same manner, inflexible, and protuberating internally, so as to be distant from the parietes of the artery, on its internal surface, and to grow out in the middle of the border, into a thick little tubercle, as if that which I delineated there, as the largest of all, in the first of my *Adversaria* (s), had not been only made bony, but even much increas'd in its bulk. Yet the great artery, from the heart even to that part where it adheres to the vertebræ, the carotids also, and subclavians, had no bony scales; which were seen in the remaining tract of the aorta through the thorax.

In the belly also, the same artery, and the iliacs, were not without those scales. The orifice of the pylorus was furnish'd with that valve, which is call'd by its own name, only on one side; and on the other side, which was the larger extent, nothing like it existed, nor seem'd ever to have existed: moreover, the orifice of itself seem'd to be much larger than it us'd to be.

The substance of the right kidney was, in two places, hollow'd out, in the one more, in the other less: and these cavities contain'd a kind of aqueous humour, included, on the upper part, in the proper coat of the kidney. The urinary bladder, which was in other respects found, had grown out into a hernia, of the same kind with that which I have describ'd in another place(t), of a hemispherical figure, and a moderate size, into which, when the coats of the bladder were relax'd, it open'd by a small orifice above the terminating aperture of the left ureter. But another true hernia, which seem'd formerly to have contain'd a part of some intestine, or a greater part of the omentum than at present, occur'd in the scrotum. It was a facculus, not very small, reaching from the right ring, as it is commonly call'd, of the abdomen, almost quite to the testicle, betwixt that coat which is taken away with the cremaster muscle, and the membrane that covers the spermatic vessels, which seem'd to be unhurt, and with the internal side of these vessels the facculus lay contiguous. For on the same side that I have already mention'd, the peritonæum descended through an orifice, capable of admitting a finger, being, after that, dilated into a facculus, and become much thicken'd in its substance. Also, a small and thin flap, or fold, of the omentum, having fall'n down through that orifice into the facculus, had grown very closely to the surface of it.

16. In regard to this dissection, it is sufficient, at present, to attend to what relates to the lungs, as the other parts of it are relative to other subjects, and will be mention'd by me in their proper places. And having produc'd examples of an inflammation in this viscus, that was not attended by its proper signs; I now go on to those cases, in which you may see that inflammation accompanied with the marks of a pleurisy, at least, which did not exist.

17. An old man, more than sixty years of age, was seiz'd at once with a fever, and pungent pain in the anterior part of the right side. He lay on his back. His tongue was dry; his pulse large and frequent. After some days

(s) Tab. 4. Fig. 3.

(t) *Advers.* 3. *Animad.* 36.

being elaps'd, and the common methods of cure, us'd in the hospital of St. Mary de Morte at Bologna, being made use of, he seem'd to be so far freed from his fever and pain, that the senior physician gave him leave to eat freely, of the common provision of the house; and after three days gave him a purge, as his custom was, to carry off the reliques of the disease. The man having eaten freely after these evacuations, on one of the following nights, the fever, and pain in the same part, return'd. The pulse was hard, quick, large, and tense, even to the last day, and even to a few hours before death; for at a time, when his respiration was indeed quick, but not very bad, and when he had rais'd himself up in bed to sit, of his own accord, so that he seem'd likely to live some days, he was almost immediately seiz'd with a stertor, and died, which was about the middle of April, in the year 1706.

His body, which was dissected the same day, had a squalid appearance, being lean, having a scabies on the thighs, and the abdomen sunk in.

When the thorax was open'd, the upper lobule of the lungs, on the right side, was enlarg'd, and appear'd to be very hard. And upon cutting into it, I saw that the substance of it was become like the substance of the liver, and that pus, or at least a matter not unlike pus, flow'd out, together with a frothy humour. In the left cavity of the thorax, was water of a yellowish colour, degenerating into green, but in small quantity. The lungs, where they lay towards the diaphragm, and in like manner on the upper side, and more closely in that place, adher'd to the pleura, a kind of yellow, and thin membrane, as it were, being interpos'd. Yet the pleura, in all this thorax, appear'd to be no where injur'd. But to return to the left lobe of the lungs; the inferior lobule thereof was black, and hard, on the posterior part, and made up of the same kind of substance that was seen on the right side; nor was it without pus, which I saw flow from it, of a white colour, when the lungs were taken out of the thorax.

In the pericardium was much water, of the same kind I just now describ'd. At each of the orifices of the heart, were distinct polypous concretions: the least of which was what went to the left auricle, and the largest, that which went into the aorta. This great artery I also observ'd to be very wide, yet equally so, and to have some marks of a beginning ossification about the valves.

When the belly was open'd, that heavy kind of smell was perceiv'd, which is generally the consequence of inflam'd intestines. And, indeed, the small intestines were red, to considerable tracts, round about. The liver; the bladder of which had ting'd the subjected pylorus, and the duodenum, to a very great degree, though the tincture had not pervaded to its inner coats; had a livid appearance on its edge, and the same to some small extent on its hollow surface. The flat surface of the spleen was very black; and the pancreas a little hard.

18. You see, then, that there were the signs of a pleurisy, in a peripneumony. And, without doubt, when Hippocrates describ'd this disorder, in his book *De internis affectionibus* (u), he said that there is a pain "some-

"times, even in the side." Which passage is not only taken notice of by Ballonius, as you see in the *Sepulchretum* itself (x), but also confirm'd by his own observations, and "particularly" in those who "have either a dropsy of the thorax, or in whom the lungs, being somewhat hard, abound with a quantity of sanies." And that he has spoken wisely, by saying not in those only, but in those "particularly," even my two next observations will shew, which were taken a few weeks before the former, and in the same hospital.

19. A butcher, of seventy-eight years of age, of a tall stature, and a pallid and brown complexion, who had been before troubl'd with a spitting of blood, had begun to feel an internal, and pungent pain, a little below the left nipple, four days before the time he was admitted into the hospital.

His pulse was not only unequal, but also frequently intermitting, and quick, and gave very little resistance to the finger that felt it: he had a frequent cough, attended with that kind of sound which is almost like the barking of a dog: his expectorated matter was thick, and had in it a kind of polypous particles, of a white colour: his respiration was difficult: he could lie only on his back. The blood which he lost on the day he came into the hospital, that is on the fifth day of the disease, to the quantity of eight ounces, had no more serum than could be contain'd in one spoon: and this serum was turbid: but on the top of the blood was a yellow crust, mark'd with livid points on the upper surface, which was hollow, and two inches deep, so that it greatly resisted the knife; and the crassamentum below, was separated into a number of distinct grumous concretions, as it were. Blood afterwards appear'd in the expectorated matter. As the disease did not at all remit, a vein was again open'd on the seventh day. The crust then appear'd thin; the serum, which was of a golden colour, was in a proper quantity, and the crassamentum of a natural firmness. The spitting being diminish'd, and all other circumstances continuing, the patient being no longer able to speak, turn'd himself upon his right side, and while he lay thereon, died placidly, and without any steror; which happen'd on the eighth day.

When we open'd the thorax the day after, we found the right lobe of the lungs adhering to the pleura, almost in every part, yet in such a manner that it might be easily separated without injuring its membrane, except the upper part of the superior lobule. For this part was grown together with the pleura, and, within its substance, which was of a black and livid hue, contain'd many small round cells, each of them being, every where, comprehended in their proper follicle; so that, as far as I could observe, there was no opening outwards, being smooth internally, and quite empty: which I judg'd to be the vestiges of an old disease, that I have already hinted at. The odour that proceeded from this part of the lungs, was like that of sour whey, or like what comes from the mouths of children, who are very ill from worms.

But the upper lobule of the left lobe of the lungs had no disorder at all: only that it abounded with a great quantity of a serous moisture. Yet the lower was heavy and red, and appear'd to have its whole substance chang'd

(x) Schol. ad § 4. obs. 20. sect. hujus.

into a substance like that of the liver. This lobule adher'd, in some places, to the pleura, and was cover'd, here and there, with broad and white portions of a kind of mucous membrane: with which kind of membrane, only red, under a little turbid serum, that surface of the diaphragm also was cover'd, which corresponded to this lobe. But it was easy to remove membranes of this kind, from the surface of that lobule, or of the diaphragm, which were uninjur'd; and especially from the last mention'd surface, as the pleura that invests the parietes of the thorax, and even the diaphragm itself, was not only, which is a very rare instance, of a cartilaginous, or bony hardness, but was, in fact, made up of thin laminæ of bony matter; and from the surface of it, that was turn'd toward the thorax, very frequent bony tubercles protuberated, especially where the bony laminæ were; being of a hemispherical figure, and of the bigness of a vetch. And notwithstanding all these appearances were seen much more on the right side of the thorax, than on the left; yet, in this also, the pleura, in many places, came up to the description above, and, in some places, came up quite to it; but in no part whatever was it at all red, or had the least appearance of inflammation. The pericardium contain'd a small quantity of water, of a reddish colour: and the right ventricle of the heart contain'd a polypous concretion, of a fleshy colour, flat and large, and extending itself into the neighb'ring auricle, besides another that was round, and more dense, which reach'd into the pulmonary artery. And another, like the last, enter'd the aorta from the left ventricle: the least of all, and not unlike an inflam'd crust, was at the left auricle. There was also black, and half-concreted blood in both ventricles of the heart, and in the great artery.

At length we turn'd our eyes towards the belly, and especially the lower part of it. For at the right flank, the abdomen was rais'd up into a flaccid, and somewhat livid tumour. But when we found, by opening this tumour, that it was owing to the colon being distended with air, in that part, we immediately went on to examine other tumours. A small one, which was in the left groin, we saw to consist of an inguinal gland, one inch in thickness, two inches in length, and one and a half in breadth: and upon cutting into it, I found that it had, in great measure, as to colour, and the modification of its substance, the appearance it naturally has; but in one little part it was white, and seem'd to consist of a kind of small and globular particles. I then found the scrotum to be tumid in both sides, but particularly on the left, the right side being red at the bottom, and on cutting into it I found three hernias. On the left side was the first, which was a sacculus, going from the cavity of the belly, quite to the upper part of the testicle; this sacculus was, at that time, rugous, and contain'd nothing but a long fold of the omentum, that could be easily drawn out: but that it had, at other times, been distended by the admission of an intestine, was not only indicated by these rugæ, but particularly by the unusual turns, and complicated folds, of the ileum, in the abdomen, and, in some measure also, by those of the colon. But the two other herniæ were of another kind, and were made up of a yellowish water, which was contain'd in the tunica vaginalis, on each side, both of which coats were become thicker than usual in their substance; and this water I readily suppos'd to have been effus'd from a ruptur'd hydatid, as I seem'd, to myself, to find out some remains thereof,

in a very small kind of vesicle, made up of thick parietes, as if they had been contracted into themselves, and, for that reason, already almost solid, and of a fleshy colour: this vesicle hung by a peduncle from the tunica albuginea, where it invests the belly of the testicle, near the greater globe of the epididymis, and this very situation had the vesicle that grew to the testis on the left side, as well as that on the right (*y*). The small canals, which serve to elaborate the semen, but still more those vessels that serve to carry out the blood, were unusually large; so that there seem'd to be a kind of beginning, as it were, of a varicose hernia, on each side, which was to be accounted for from the other herniæ, rather than from the falacious disposition of the man, inasmuch as, without any traces of disorder having ever preceded, the preputium was contracted beyond the glans, just as it is found in those young men, who have not as yet had any knowledge of venery.

20. All the circumstances which you have read in this prolix history do not, as you see, relate to our present purpose; yet I have written them all down together, as my general method is, lest I should render obscure, by a divided narration, what were join'd together by observation. Among the circumstances to be taken notice of here, were those white kind of polypous particles, in the living body, which were thrown up with the expectorated matter. And, certainly, they might be really polypous. For as polypous concretions are sometimes made up, in the uterus and intestines, out of several viscid corpuscles, condens'd into one, why may not the same thing happen in the aspera arteria? And, indeed, as I have seen those bearing the form of the uterus, and intestines, so, in like manner, have I seen these bearing the form of the aspera arteria, and especially in a young man, who lay ill of a peripneumony, in the year 1704, in the hospital of St. Mary de Vita, at Bologna, of which he also died in a few days, as I remember, but was not dissected, whatever the cause of it might be. For as he had spit up such matter by expectoration, that the attendants, who had long been accusom'd to such patients as these, and even the physician himself, who was in other respects a man of great experience, never remember'd to have seen, consisting of white portions, sprinkl'd over with blood and froth; some of us thought proper, that part of this expectorated matter should be thrown into water, and agitated there, for the sake of examining into it better; and while this was done, we saw one of these portions divide itself into three branches, and each of these, again, into many smaller branches, which at length dwindl'd into the slenderness of a hair.

But I afterwards saw, that a concretion of this kind, thrown up from the aspera arteria, had been represented in a figure by Cheffelden (*z*), so as to shew the manner of its division. And then it came into my mind, in whose writings I had before seen representations of other concretions of this kind: and first, for instance, in the writings of Ruysch (*a*), who express'd even the small capillary branches; but when he admonish'd, that valiform polypi of this kind “ differ in no circumstance, as to the appearance, from arteries “ and veins, but by the want of a cavity alone, as they are every-where

(*y*) Vid. Epist. 43. n. 16. & seqq.

(*z*) Anat. of the human body, Tab. 19.

(*a*) Resp. ad Epist. Probl. 6. Fig. 4.

"hard and solid," he has, contrary to his intention, confirm'd in an error, which he endeavour'd to remove, some persons whose names must be spar'd, who without doubt lit on polypi of that kind which were hollow. For *Bussierus*, whose delineation I had also seen in the *Acta Eruditorum*, which were publish'd at *Leipfic* (*b*), has not only taught how they might be form'd hollow, but also took one out from the whole *aspera arteria* of a boy, that was hollow, which boy was foolishly suppos'd, when living, to have cough'd up a venous vessel of the lungs. And even the celebrated *Nicholsius* (*c*) saw two of these concretions, expectorated by an asthmatic man, both of which were ramified and hollow, and these he afterwards also gave a representation of. Nor do I doubt, but that was of the same kind, although it was not ramified, which is describ'd as "a red fleshy mass, like meat fresh kill'd, without any ill smell, equal in length to an internode of the little finger, and in breadth to the thickness of it, but form'd, internally, like any venous vessel," which being thrown up by coughing, from a boy of eight years old (*d*), who had cough'd violently every winter, and spit up viscid matter, he was immediately freed from his disorder.

However, many persons have seen ramified concretions cough'd up, and among these the illustrious *Senac* (*e*). And our *Pasta*, a very experienc'd man (*f*), having produc'd three examples of this kind, which were seen by himself, was at the same time, and that not without the greatest reason, of opinion with those, who referr'd to the same class, those two which had been describ'd by *Tulpius* (*g*), as if they had been examples of a real pulmonary vessel being thrown up by coughing. And to this class, you will easily believe are to be referr'd, not only that spoken of by *Bartholin* (*h*), who, like *Tulpius*, added a figure to his description, but also others, that are taken notice of by *Moellenbroccius* (*i*), and *Mackius* (*k*), and perhaps by others, and that "little piece of a vein, expectorated by coughing, from the lungs," which *Marcellus Donatus* (*l*) mentions, from *Nicolaus Florentinus*, so much the more in proportion as those things were less known at that time which are known in ours: although I cannot help wond'ring that *Donatus*, who says, "he was not willing to omit it, as a circumstance which very rarely happen'd," did not make mention of *Galen*, in the reading of whose works he was very well vers'd, as saying (*m*), "That he had seen a certain portion of a vessel, not very small, thrown up by coughing, which was clearly understood, by those who were not unskilful professors of the art of dissection, to have been drawn out from the lungs: for all the vessels that come to the *aspera arteria*, in the neck, are, in general, to be referr'd to the species of capillaries." But whether *Hippocrates*, in that history of the epidemics (*n*), which begins thus: "Pherecida was seiz'd in the night, after the winter solstice, with a pain of the right side;" and ends, as *Valesius*

(b) A. 1701. Tab. 4. Fig. 5.

(c) Vid. *Commerc. Litt.* A. 1733. Hebd. 37. & Tab. 2. Fig. 1.

(d) *Act. N. C.* Tom. 1. Obs. 196.

(e) *Traite du Coeur*, l. 4. ch. 3. n. 2.

(f) *Epist. de Cord. Polyp.* n. 11.

(g) *Obs. Med.* l. 2. c. 12, 13.

(h) *Cent. 3. Hist. Anat.* 98.

(i) *Eph. N. C.* Dec. 1. A. 2. Obs. 91.

(k) *Earund.* Dec. 2. A. 10. Obs. 102.

(l) *De Medic. Hist. Mirab.* l. 3. c. 10.

(m) *De loc. aff.* l. 1. c. 7.

(n) *L.* 7.

has justly acknowledg'd (*o*), in these words, "Before death she threw up, by coughing, some fungi, as it were, made up of mucus, and had also excreted before little white milky particles;" I say, whether Hippocrates, in these words, points out concretions of that kind, I leave undetermin'd, because the same very skilful interpreter does not doubt, but that this history "has been vitiated in a thousand ways," and that "not only on account of the antiquity, but of the corruption of the copies." It may, however, be sufficiently understood, from what I have said, that either from polypous blood, as in the uterus, or even from serum, as in the intestines, thrown out into the bronchia, and stagnating there, concretions of that kind may be brought on in their cavities. And this being granted, I think another circumstance may also be understood, that is, how it happens that the substance of the lungs, when inflam'd, entirely resembles the substance of the liver. That is to say, where not only the sanguiferous vessels, but also the branches of the bronchia, and all the small branches going to any particular part of the lungs, and the vesicles communicating therewith, are all fill'd and stuff'd up with polypous concretions, there must of course happen to the lungs, what we read of in the book *De Veteri Medicina* (*p*), in this manner: "When the lungs themselves have taken a humour into their own substance, the empty, the rare, and the small parts of them, are entirely fill'd up; and instead of a rare and soft body, the lungs become hard and dense, and neither concoct, nor discharge, any part of the tumour they have taken in."

You very well understand, then, how that new hardness is brought about, instead of the softness and rarity of texture, and also that liver-like kind of density, from all the very slender pipes and vesicles being fill'd up, which are naturally empty, and, consequently, how it happens, that, instead of their usual lightness, the lungs have also a weight suitable to the substance of the liver. But the colour is at one time more red, or black, and at another time more pale, as the red part of the blood, being at one time more or less condens'd, and at another much less, or not at all, stagnates with the polypous part of it, in both the species of vessels; nor yet is there always blood, which, by making an impetus on the small vessels, may distil into the aspera arteria; but even frequently only a serum, strongly impregnated with polypous particles, distils from the glands of the trachea, inasmuch as these particles, in disorders of that kind, circulate with the blood in a great quantity, as is shewn by the thick polypous crust generally to be seen on the upper part of peripneumonic blood, when let out from the vein, and coagulated: such as was seen in this old man also, of whom I speak, when blood was first taken from him.

21. But as the crust on that blood, which was taken away two days after, was but thin, must we suppose the cause of it to have been, that a great part of the polypous matter had, in the mean while, stagnated in the lungs, and increas'd their infarction? For if you do not disapprove of this cause, you certainly understand from thence, how little opportunely some physicians rejoice, who, without attending to other circumstances, consider this one

(*o*) Comment. in eund. l. n. 82.

(*p*) N. 40:

thing only, that the crust on the blood, which had been before thick, is now become thinner, or, perhaps, is none at all. Yet be cautious, on the other hand, how you agree with those entirely, whom I have sometimes heard pronouncing, that if, in disorders of this kind, the blood, which is taken away at the second time, be without a crust, it is so bad a sign, that, if blood be let a third time, the patient must die; because there are many circumstances, which may, by mere chance, prevent the existence of this crust, that would otherwise have existed, which circumstances are frequently not attended to. Sydenham (*g*), who flourish'd in England, at a far different time from that in which he liv'd, who, according to Marcellus Donatus (*r*), and Vincentius Baronius (*s*), affirm'd, "that the disease call'd pleurisy, was seen "very rarely among the English, so as to be almost a new disorder to them," as he certainly found no disorder more frequent than this, has observ'd many things in relation to it, as you know; some of which although the physicians of our country do not imitate, as this, for instance, "that during the disease, "---- the patient should be taken out of bed every day, and that for some "hours," yet there are some other things which are very good; and among these, what relate to the crust upon the blood, which, if not always, as some have remark'd (*t*), yet, at least, answer so often, that Boerhaave receiv'd them as true maxims (*u*). And when you have attended to these observations, you will readily conceive how easy it is to be deceiv'd, when that crust is thin, or there is no crust at all, unless the physician, when he looks at the coagulated blood, knows, whether at the time it was taken away, it first crept down the arm, or came forth in but a small stream, and at length whether it was shaken while it was yet warm. And yet, how few physicians, especially in some places, enquire into these circumstances, when they look upon the blood! or whether it coagulated in an air immoderately cold, or warm! tho' the very learn'd Senac (*x*) has mention'd, that by either the one, or the other, of these circumstances, the separation of the serum is prevented. On these accounts, therefore, I was not willing, just now, to determine any thing in regard to the blood of this old man, describ'd by me, as to the cause of its change, although I do not doubt, but I made many enquiries at that time which are not noted down in my papers, especially as it was not chang'd in that one particular only; and I know very well, that of what relates to observations on blood, that has been taken from a vein, and the inquiries into the causes of all the appearances, which are seen therein, in so great a number and variety, many things are still wanting among physicians, and certainly may still be long wanting.

22. But as to what relates to the pleura being found bony, after death, the circumstance is certainly of too rare a nature, to be attributed merely to old-age. I have dissected many older men than this, and among these one who was spoken of above (*y*), about twelve years older than this man was; and yet I never lit on a like appearance. It is true, that in the year 1741,

(*g*) Sect. 6. cit. supra, ad n. 14. c. 3.

(*u*) Aph. § 314, & 901.

(*r*) De Hist. cit. supra, ad n. 20. l. 6. c. 4.

(*x*) Tr. cit. supra, ad n. 20. l. 3. ch. 4. n. 8.

(*s*) De Pleuripneum. l. 1. c. 2.

(*y*) N. 15.

(*t*) Vid. apud Swieten Comm. in Boerh.

Aph. § 890.

in an old man, of a moderate habit of body, who died of a diarrhœa, and whose body I made use of for the demonstration of many things, in the natural way, to my pupils, when it was hardly possible to pull away one lobe of the lungs from the back without laceration, we observ'd that betwixt the ribs and the lungs, a bony lamina was interpos'd, part of which I still preserve. This lamina adher'd to some of the ribs, and to the spaces that lay betwixt them, near to the vertebræ, yet in such a manner that it could be easily drawn away : and this vicinity you will also observe in the following history. But besides that I doubted, whether this lamina belong'd so much to the pleura, as to the membrane of the lungs, it was not much more than an inch in width, and ten fingers breadth in length; nor did any thing of that kind occur in any other place but in this.

However, the most-excellent Haller (*a*) has sometimes seen a "callosity" of the pleura, but especially in a thief, who was publicly hang'd, so that "it took up a large space, equal to the extent of a man's hand." The same appearance was, likewise, in this man, where the pleura touch'd "the ribs behind;" yet in that part neither "was it a bone, but a callus."

And the celebrated Hottinger (*b*) found "the lungs grown to the left side, and the pleura invest'd with a kind of matter, not unlike to a cartilage;" and this he judg'd to arise from a pleurisy, under which the woman had labour'd some years before. Perhaps also, this thief, and the old man I have spoken of, had that membrane made callous, and bony, from an inflammation which had formerly preceded.

But to omit these things, and revert to our first proposition (*c*); the pleura was not inflam'd in that history of which I have hitherto spoken, nor did the lungs abound with any great quantity of sanies, nor did the thorax labour under a dropsy; and yet a pungent pain was perceiv'd below the nipple. Now let us go on to the other history, which is very similar in all these circumstances.

23. A man about forty years of age, was seiz'd with a pungent pain on the right side, with a fever, and great heat. When he was brought into the hospital from home, where he had been let blood, which was on the beginning of the fourth day of the disease, he had a small, quick, and somewhat unequal pulse; and his respiration was also quick, and weak. He lay on his back. His countenance was sleepy. He was a little delirious. He spent the night in a very disturb'd manner, his respiration being difficult. But in the morning, it was still much more so; so that a stertor coming on, he died about the end of the same fourth day.

The thorax being dissected, on the following night, we saw nothing in the pleura, that was preternatural, except that near the left side of the spine, it was made rough with three or four tubercles, the colour of which was white, and the hardness like that of a bone. On that side, the lungs were almost sound; but, nevertheless, were impregnated with a yellow humour, wherever we cut into them, which even proceeded, in a very considerable quantity, from the right lobe. For this being grown more large, heavy, and hard, resembl'd the substance of the liver, in every part, some pretty

(*a*) Progr. de indur. corp. hum. partibus § 2. (*b*) Eph. N. C. Dec. 1. A. 10. obs. 231.
(*c*) n. 18.

large tracts being excepted, in which it was of a whitish substance, and verging, as it were, to putrefaction.

In all the orifices of the heart was somewhat of a polypous concretion, the least of which was at the left auricle, and the largest at the right, being, in both places, accompany'd with grumous blood; and betwixt the size of these two, were the two others, which reach'd to the pulmonary artery, and aorta.

When the cranium was open'd, I found the vessels of the pia mater to be somewhat turbid: and under this was a water; some portion of which was also in the lateral ventricles, but of a reddish colour. The plexus choroides were not pale, and yet not without hydatids.

At length we open'd the abdomen, and the small intestines seem'd, in some places, but in very few, to have the beginning of a slight inflammation. The liver seem'd to be somewhat hardish: and was livid, both on the edge, and through a large extent of the hollow surface; but here it was superficial only, not so in the former place. Finally, the spleen was so lax, that by applying the fingers to it, it was torn to pieces without any difficulty.

24. A woman of a middle age, died in the same year, 1706, and in the same hospital, as the three of whom I spoke last, and not long before them: her disorder was as follows. Being now in the third month of her pregnancy, she miscarry'd. Although, after this, as much blood was discharg'd from the uterus, as seem'd to her to be sufficient, and although a vein had been open'd over and above; yet on the eighth or tenth day after her miscarriage, without any previous cause that she knew of, she was seiz'd with an internal inflammation of the thorax: on account of which, she lay ill first at home, and after that, in the hospital, till the very last day of her life, which was about the thirtieth after her miscarriage. There, while she lay always on her right side, for on her left side, or back, she could not lie, the complain'd of a pain in her thorax, besides a fever, and difficulty of breathing; which pain was internal indeed, so as not to be exasperated by the touch, but the situation of it she could not accurately define. She cough'd, but either expectorated nothing, or, at least, nothing which related to the disease. A deafness came on, and a pain in the ears: for which reason, I suppose, as they had taken blood from the arm before, they took some also from the foot. But all was in vain.

The thorax, the head, and the belly, we could not dissect till three days after. In the first of these cavities, I found a little turbid water on both sides, but the least on the right side. The lungs being every where connected with the pleura, when we endeavour'd to pull them away, a kind of whitish pellicle follow'd, which was easily ruptur'd, and certainly was not the membrane of the lungs, as this was entirely found beneath, and uninjur'd: but whether it was from the pleura, could neither be sufficiently determin'd at that time, nor should I now, for a certainty, decide, when I call to mind those membrane-like concretions, of which I have often spoken: which it was evident to me, did neither belong to the pleura, nor to the lungs, not only frequently, when they were, as yet, fresh, and soft, but even after they had been dry'd by lying a long time; and this in the bodies of some persons, who had formerly escap'd from disorders of this kind, as in that which I dissected, when I wrote this letter. For upon pulling away the right lobe of the lungs, which adher'd almost to the whole side, and the nearest

nearest part of the back, without leaving any interval betwixt, and seeing a dry, dense membrane remain continu'd through that whole space, which certainly did not belong to the lungs, as they were invest'd with their own proper membrane, which was in a sound state; I also observ'd, that, in like manner, it did not belong to the pleura, because I saw that this membrane lay under the other quite uninjur'd, and I took away the former membrane with ease, by drawing it off, at one pull.

But to return to the woman; her lungs were inflam'd, particularly at the posterior part; for they shew'd a more dense substance, were somewhat hard, and, in several places, even of a blackish colour. In the pericardium was some quantity of a turbid, and reddish water. In both the ventricles of the heart, were polypous concretions, made of a kind of mucus, of a middle colour betwixt white and yellow.

The top of the cranium being taken off, and other things of that kind being premis'd, there was seen a small concretion in the upper sinus of the falx, and a small quantity of water under the pia mater; but in the ventricles scarcely any. Nor yet was the cerebrum altogether lax: and the plexus choroides were in a very natural state. Yet the pineal gland was of such a bigness, as to equal the size of a small grape, and was no sooner touch'd gently with the knife, but it discharg'd a turbid water, and a little yellowish and mucous matter, and immediately subsided in its magnitude. We then look'd within the cavities of the ears, and found the membrana tympani, on each side, to be blackish, and very flaccid, and the mastoid cells that lay the nearest to this membrane, on each side, to be more moist than usual: and indeed, in one of the tympana was a purulent kind of matter: and externally in the neighb'ring part of the head behind, especially at the left side, all the cellular part of the common integuments was distended with a kind of mucous water. Yet on both sides, the meatus auditorius and the parotid gland were sound.

At length, we thought proper to open the belly, because it swell'd downwards from the epigastrium; and if you press'd upon the tumour, flatus immediately came out, through the mouth. And this was owing to the liver, which was the biggest I had ever seen, at that time, having driv'n down the stomach, into the umbilical region. The stomach was tumid with air. And the liver was every where hard; yet in its colour, although it inclin'd to a white, was not greatly alter'd from what it naturally is. In the vesicula felleis the bile was almost black. The spleen was large, but not to compare with the liver.

The parietes of the uterus seem'd to be a little thicker than usual, but without blood, whether I cut into them transversely, or by pressing my fingers underneath, I endeavour'd to squeeze out the blood from the internal surface of its fund, which was livid. One of the Falloppian tubes had hydatids hanging to its fimbriæ, in such a manner, that the greater orifice thereof might seem to be shut up. But each of them so far abounded with a great quantity of its white puriform humour, that if you compress'd the thicker part of the tubes, towards the orifice, that humour would issue forth, and demonstrate the orifice. But in the middle of one of these tubes internally, was a small body resembling, in its shape, that of a grape, and had the appearance of a kind of stalk, which body seem'd to be a grumous

concretion of blood, and perhaps was really so. The ovaries were unequal in their surface, and both of them were mark'd with a black spot. Under these spots was a kind of peculiar cyst, fill'd up with a black globule. And in the middle of one globule was another lesser kind of cavity, which, in regard to its colour, was of a mixture of black and yellow. However, the uterus, and the parts annex'd to it, had the odour of a violent sphacelus, as it were: and in the pelvis of the belly, was a little reddish and turbid water.

25. These last circumstances we observ'd when we made our enquiries in regard to the foregoing abortion. What was observ'd in the pineal gland, confirms that some of the uses ascrib'd to it are not justly ascrib'd. As to what I remark'd in the ears, they are to be referr'd to those things which I have hinted elsewhere (*d*), in regard to the cause of deafness in acute disorders.

What were observ'd in the lungs relate to our present purpose. And yet you will scarcely account for the inability of lying down on the left side from thence; but rather from that great bulk of the liver, which overloaded the stomach less when the woman lay on her right side. For how much the stomach may be thrust downwards, sometimes, by an over-grown liver, the Sepulchretum will, in other places, shew (*e*).

26. Now I will pass over from this kind of epidemic inflammation of the lungs, which rag'd at that time among the poor at Bologna, to another at Padua, which spread about in the winter of the year 1738; and no where more than in some convents of nuns, and especially in one, to such a degree, that all who were seiz'd with it died, and some even within four days. Which was the reason, without doubt, that, as nine had already died, I was publicly commanded to enquire into the nature of the disease, even by dissection. It was not difficult to conceive, that there was nothing contagious in it, as none of those who had attended upon the sick had contracted the disease, and even they, who had taken the most care to keep themselves from them, were seiz'd with it; but not without a peculiar cause, and disposition, in almost every one. One of them, for instance, had had an ulcer of long standing in her leg, which was now healed up; another had had a previous fall upon her chest, and had spit a great quantity of blood in this last sickness; another had been long inclined to a pulmonary phthisis; and in fine, others had other causes to render the powers of the thorax and lungs infirm, as they who were of a decrepid age.

But nevertheless, although out of those who had been ill at that time, notwithstanding three different physicians had been employ'd, some having been attended by one, and some by another, not one could be sav'd, as I have said; yet by many this was not ascrib'd so much to the violence of the disorder, as to its nature not being well known, and especially by the inhabitants of the convent. And by what means I extorted this judgment from them, you will know from the subjoin'd history. For when the tenth was now dead, and those physicians and I came together to the dissection of her, I begg'd of them, before the dissection was begun, that they would relate what had been observ'd, and what had been done, in the disorder. Which the senior physician who had attended upon her, did very accurately in the

(*d*) Epist. 6. n. 5.

(*e*) Vid. l. 2. S. 7. Obs. 61.

manner I shall relate presently ; the others at the same time affirming, that they also had seen, and done, almost the same things, in the others, except that one, who had given fresh-drawn oil of almonds, ingenuously added, that the patient had been worse from it. But let us come to her who was then to be dissected.

27. A virgin, of two-and-forty years of age, who had, every winter, been subject to a violent cough, of a very good habit of body, and abounding in blood, being employ'd in great and continual labours, for the service of the convent, was seiz'd, in the night, with a fever, with which she first shivered, and was cold through her whole body, and after that grew hot. After an interval of twenty-four hours, a pain on one side of the breast was added to the fever, together with a difficulty of breathing, a cough quite dry, and a rather hard pulse, which resisted the pressure of the fingers, even almost to the very time of the patient's death. In the progress of the disease, the pain shifted from one side of the breast to the opposite part. There was a sense of weight within the thorax. She could lie down upon neither side. In the blood that was taken from her the serum was of a greenish colour, there was a polypous crust, and the other part of it, that lay under this, had a very great blackness and hardness. And blood was taken away immediately as the pain came on, and after that once, and even twice, in a proper quantity, for a body of that kind ; and not only from the arms, but from the feet also, within the same day, as the custom always is here, in regard to women. Nor was any thing omitted besides, of all the remedies customary in disorders of this kind. Nevertheless, on the beginning of the seventh day she died. When I had heard this relation, I said, in dependance upon those appearances, that I had always found after the chief of such kind of symptoms, " Come, let the body be dissected ; this will be certainly found to be the nature of the disease, that the lungs shall appear to have the substance of the liver."

In the thorax, then, when open'd by the surgeon, there was no extravasated humour, and no connexion of the lungs with the pleura, except at the left side ; and this was neither very close, nor to any considerable extent. While this connexion was disjoin'd, and the lungs, on that account, press'd, a turbid serum flow'd out, in some considerable quantity ; but whether from the lungs, as it seem'd to us, or from the interstice left between this and the pleura, within the borders of the connexion, was the more uncertain, as neither the lungs, nor the pleura, in that place, shew'd any particular injury ; but the lungs were cover'd with a whitish and thickish kind of membrane, such as I have often describ'd in the foregoing histories, even where the lungs were quite free ; and to the corresponding pleura, quite upon the surface, adher'd a reddish kind of sediment, such as would subside in water wherein fresh meat had been wash'd. In another place, where there had been no adhesion, the surface of the lungs was prominent into a kind of tubercle, which being cut into, discharged a whitish kind of serum like pus. We then ordered the lungs to be taken out : and they were not only heavy, but, in more than one place, hard. When they were cut into, they appeared to have a dense and compact substance, like that of the liver, as I had predicted, and not only on the surface, but to great depths internally, being in other parts, in general, of a redder complexion, and abounding with that whitish

whitish serum which was found in the tubercle : and from hence it was very evident, that the inflammation of both lobes of the lungs, which already degenerated into suppuration, had been the cause of her death. However, in the pericardium was scarcely any serum ; and in the heart no polypous concretion was found ; because the left ventricle contain'd scarcely any blood, and the right only a little more, which was black, and not at all fluid.

28. Having found these appearances, I return'd, together with the other physicians, to the place where we were expected by the abbess, and said to her, It is not an unknown and a rare disorder, as you was afraid, which has carried off so many virgins ; but the vehemence of one that is very common, and very well known. And to convince you that it is really so, I foretold, previously to the dissection of the body, that the lungs would be found to be in such a state, as they were really found to be in ; and this it would have been impossible for me to have done, if I had not very frequently dissected those, who died of this disorder : and I did it on purpose, that you yourselves might readily understand that to be true, which I just now pronounc'd. By this means they were freed from their fears, and their opinions of the disease being unknown ; and our discourse was turn'd to propose that method, which has turn'd out most successfully, by which the other nuns, and especially those who had their lungs very lax, and weak, might beware of the disease ; for it did not seem at all doubtful to us, but that the peripneumony could not be overcome in those who had died, chiefly for this cause.

You will perhaps here ask me two things : one, who first observ'd formerly, that in those who were carried off by an inflammation of this kind, the lungs resembl'd the substance of the liver ? and the other, whether, after mortal inflammations of the thorax, I have never found great injuries of the pleura also, just as I have found the lungs affected, in the manner I have been describing.

As to the first, I do not now readily call to mind, whether any one mention'd this circumstance very expressly, before Lælius a fonte. But you must turn to his book. For although his observation is put down, at least three times, in the first volume of the Sepulchretum ; once where the question is of injur'd respiration (*f*), and a second, and a third time, in this section on pain in the breast (*g*) ; yet that, which I speak of, is always omitted. In short, you will but just find it, at last, in the fourth book of the third volume, under the title *De Febribus*, to which the readers are referr'd, if by diligently examining into that prolix first section, you light on the sixth article, under observation forty-five. And there, indeed, you will read this : " The flesh " of the lungs was found to be dense, hard, and red, as the flesh of the " liver is us'd to be ;" but still you will not read that the disorder, after which this appearance was found, had been judg'd by Lælius to be, beyond all doubt, a peripneumony, as the symptoms really shew'd. You are under a necessity, therefore, of looking to this consultation, which either is not mark'd out in the Sepulchretum, or is so mark'd out, that you would suppose the mark to be a hundred, when it is really ninety-eight. And although I am not ignorant that others after him, and some even in this our

(*f*) 1. 2. S. 1. Obs. 24.

(*g*) Obs. 9. §. 10. & Obs. 16.

age, and among these Jo. Bapt. Fantonus (*b*), Dominio Gagliardi (*r*), and Frederic Hoffman (*k*), have found them in the same state, as will be shewn more at large below (*l*); yet to whom it happen'd, as it seems to have happen'd to Valsalva, and as, one diffec-tion excepted, it certainly has happen'd to me, that the lungs were always found in this state, I do not readily call to mind.

But in regard to the other, that is, the remarkable injury of the pleura, and which may be compar'd with what I have describ'd in the lungs, if you read over all Valsalva's observations, and mine, that relate to mortal inflammations of the thorax, you will evidently perceive, not only that it never happen'd to either of us to see any great injury of the pleura, without that of the lungs, but even not in conjunction with it. And my observations of this kind are not only such as are hitherto propos'd in the present letter, or have been already produc'd in others (*m*), but also such as will be produc'd immediately, in the sequel of this letter. You will find, indeed, in some of the foregoing histories, and in all of those which follow, that an injury of the pleura was join'd with an injury of the lungs; but whether to so great a degree, that of itself it could prove mortal, or at least more so than the injury of the lungs, you yourself will judge.

29. A servant-maid, of nineteen years of age, a virgin of a full habit, and plethoric, having had her menses flow less freely than usual for three months past, was seiz'd with a pungent pain in her breast, and a difficult respiration, in consequence of being expos'd to a cold air, at the time of her menstruation. This pain remain'd fix'd below her left breast, and was encreas'd by the touch; so that she could not lie on that side. She was brought into the hospital of St. Mary de Morte at Bologna, after having had a vein open'd in the arm, on the strain'd side. The symptoms I have mention'd continu'd. She lay upon her back. Her pulse was quick and small, and, if you press'd it, gave but little resistance to the fingers; yet was not unequal: there was a sound in the aspera arteria like that of boiling water: she had a deep, hollow, and dry cough: her tongue was parch'd: her belly was lax; but moderately so. At intervals a slight degree of delirium came on. Blood being taken from the right arm, and examin'd, after standing six hours, shew'd a little serum, of a golden colour, and something turbid, and a crust of the thickness of two inches, of a yellow colour, so as to resemble rancid fat, the circle, into which it had form'd itself, touching the sides of the vessel round about. This crust, when the vessel was inclin'd, disjoin'd itself into many laminæ, and that part of the blood which lay below it, into many grumous concretions, not much unlike some kind of soup, with pieces of meat stew'd in it. On the same day, after this venæsection, a little blood, or rather serum slightly ting'd with blood, flow'd from the uterus. All the symptoms growing worse and worse, the pulse being made much deeper, as if the artery had been drawn inwards, and a humour flowing out of her mouth like frothy water, in

(*b*) Obs. Anat. Med. 27.

(*r*) Relaz. de' Mali di petto.

(*k*) Medic. Rat. Syst. Tom. 4. P. 1. S. 2.

c. 6. thes. path. §. 12. (*l*) n. 40.

(*m*) VI. n. 12. & VII. n. 11. & 13.

which

which fresh meat has been wash'd, she died about the beginning of the seventh day.

I dissected her body on the following day, which was on the eighteenth of March, in the year 1706. The lungs every where adher'd to the parietes of the thorax, even those that are made up of the septum transversum, in some few places, by means of membranes, but in many more, and especially at the sides and back, by themselves, where their membrane, being uninjur'd, join'd itself to the pleura, which was only a little thicker than it us'd to be, and easily divisible into two laminæ. The superior lobe of the lungs, on the left side, was universally compos'd of a hard and compact substance, like that of the liver, and inclin'd, in its colour, to that of a darkish white. All the other lobes of the lungs, although entirely distended with a frothy humour, preserv'd their natural modification of substance: from which, when cut into, that humour issu'd forth, and at the same time, a white matter flow'd out from several of the small branches of the bronchia, in every respect like pus; yet from one, unless perhaps it was a small sanguiferous vessel, a white, but not fluid, matter issu'd forth, which I look'd upon to be a polypous concretion. In the very trunk of the aspera arteria, and in the larger bronchia, into which that tube first divides itself, I saw a matter collected here and there, and forming itself into concretions, of a white and cineritious colour mix'd, with which the tongue also was cover'd over: and I press'd out a whitish and somewhat thick matter from the mouths of the glands, which lie on the back part of these tubes. But the larger glands, which are found at that first division, and are call'd bronchial glands, did not all seem sound. Moreover, in the lungs, betwixt one lobule and another, in some places, were interpos'd those white membranes, which are frequently describ'd above, in this body pretty hard, and somewhat thick, but still false. In the pericardium was some quantity of reddish water. In the ventricles of the heart was no blood, but polypous concretions, in great part solid, and consisting, as it were, of fleshy membranes; yet in some measure also mucous. One of those that were in the right ventricle, was extended within the neighb'ring auricle, and went on into the venæ cavæ; and another, which was round, was carried into the pulmonary artery, and the branches of it. But through the left ventricle only one pass'd, which was in like manner round, and inflected, on one side, into the aorta, and on the other into the left auricle, and the pulmonary vein: and the cellular membranes which surround the trunks of the great vessels that I have mention'd, as they go out from the pericardium, seem'd to be of a mucous consistence, by reason of the water that was collected in them.

When the abdomen was open'd, a strong smell issu'd from its cavity, such as proceeds from inflam'd viscera, already verging into a state of gangrene. But the liver was of a whitish colour; though the spleen was infected with a gangrenous blackness, yet not very deep, and to a moderate extent, and this on the inferior part, so that it did not lie in contact with the diaphragm, on that part; and the diaphragm was sound. But a still more strong and disagreeable smell issu'd from the uterus, and the parts that were annex'd to it, on each side, and behind. About these parts was a small quantity of water, and that a little reddish: and all of them were externally

livid,

livid, from the foregoing inflammation, which still discover'd itself in the lower part of the rectum, and the pudendum also, by its redness, the very smallest vessels being as conspicuous as if they had been injected with red wax. Upon cutting out all these parts together, in order to examine each of them more accurately, I was struck with the appearance on the inside of the thighs, which were most disagreeably variegated from the fire that this virgin had been accusom'd to put under her clothes, in the winter time, frequently, and in great quantity: and this I take notice of by the way, because, according to the opinion of some, it might seem that she ought to have had her menses flow more freely, in the last winter months, for this reason, instead of being less in quantity. The testes were not less than those of a moderate size in men, soft, and, among a very great number of vesicles larger and smaller, full, as they generally are, of a fluid, and amply furnish'd with small twigs of blood vessels, which in these testes were to be met with in great quantity, had each of them two cells, one of which contain'd a black little body, perfectly spherical, very much like a coagulum of blood that is dried; but the other contain'd nothing, being made up of the little membrane itself corrugated, which, from a yellow and white colour, degenerated into green, and was, at least in one testis, very near to the surface, which, if it did not open in that place, was certainly, however, not without marks of a foregoing injury.

The uterus and vagina being open'd; in the latter, about the mouth of it, were still two little coagula of blood, which could be press'd out, with great ease, from the inner surface of its neck, but particularly from its fund: the surface of which, as it was not tense in this body, had, at first sight, represented a kind of mucus, with which it was cover'd over. But this does not belong to the present occasion, nor yet the situation of the tubes, nor the nature and situation of the rugæ of the vagina, nor the globular caruncles plac'd behind the hymen, which was here quite entire, nor other things of the like kind, which although I have observ'd in this, and in other virgins, yet some learned men seem, in part, not to have seen, and, in part, not to remember, that they were formerly describ'd by me. Nor does it relate much to the present purpose to remark, that we found a defect of those pituitary sinusses, that are call'd maxillary, and sphenoid, as the use of them was supply'd by the encreas'd magnitude, and number of the others.

But the other circumstances which I shall subjoin, do relate to our present subject. For in the head, the fauces, and the neighbouring parts began to smell strong, as if from inflammation. And from the cranium, when open'd, such an acid smell proceeded, if I may be allow'd to speak so, as comes from the mouth of a child who has worms. In the upper part of the falciform sinus, were white polypous concretions. The vessels that creep through the dura mater, were a little more turgid than usual. Betwixt that and the brain was water, yet in but small quantity, as also in the lateral ventricles, where it was of a reddish colour. The plexus choroides were somewhat pale, and contain'd a few hydatids only, but such as were of a large size. Finally, the cerebrum was a little softer than usual, and the cerebellum much more so.

30. A man, aged six and fifty years, of a moderate habit of body, a tall
VOL. I. 4 I stature,

stature, and a manner of life, in many circumstances, very irregular, having, not long before, undergone great fatigue in ringing of the bells in churches, which was the means of his support, had now, for some days, suffer'd a slightly pungent pain, at the internal and lower part of the sternum, when at length this pain was greatly increas'd, a fever coming on the same day, not long after, join'd with a difficult respiration. In the mean while, two or three spontaneous stools came on, which consisted of a bilious and warm humour. At length he was brought into the same hospital, in which the virgin had died two weeks before; but so much too late, that blood could not be taken from the arm, till the latter part of the fourth day, after the fever had begun. The blood had but little serum, and a crust two inches in thickness, of a white colour changing to yellow. On the fifth day, the pulse was full and hard: he spent the night almost without rest, and could scarcely breathe at all. The urine, being examin'd before the end of that day, was of a saturated colour, and not very pellucid; the pulse was frequent, equal, and not hard: his respiration was difficult, and attended with a groan: the pain continu'd in the same place: he could lie on which side he pleas'd: his expectorated matter was thick, frothy, and of a variegated yellow. On the night following he was troubld with a pain and cough. In the morning his pain was more mild: his spitting and pulse were the same; his urine also was nearly the same, except that it was somewhat red, in small quantity, and a little turbid. Near the end of this day, which was the sixth, blood was taken from the right hand: but as all of it was effus'd from the vein into water, it could not be examin'd as it ought to have been. On the beginning of the seventh day, the patient seem'd to be a little better. Nevertheless, about the end of that day, the pain was become more considerable, the pulse much less, and more quick, as the respiration was also; and the tongue dry. In the beginning of the eighth day he had profuse sweats: and this disposition was encourag'd, as much as possible, with gentle provocatives, by the physician, who had all this time been applying, both internally and externally, the remedies usual on such occasions; but all were to no effect. The succeeding night was very much disturb'd, and at the end of the day the breathing was very quick, the pulse small, and gave but little resistance to the pressure of the fingers: he spat up a crude yellow matter, which was fluid, and without froth: the urine continu'd to have the same appearances. On the beginning of the ninth day, being able to put his arms out from under the clothes, as he pleas'd, and to speak, though with some difficulty, the attendants suppos'd, for these reasons, that he would not die; but, contrary to their opinion, he died soon after.

The thorax contain'd water on both sides, and on the right side, at least, it was yellow and turbid. Both lobes of the lungs were connected, on the upper part, to the pleura, which, in that part, and in other places, also, of the right side of the thorax, was somewhat thicken'd. And in this cavity pieces of that membrane, as it were, lay upon the surface of the lungs, which was, in other respects, uninjur'd. The lungs themselves, on this side, were very heavy, and consisted entirely of that substance like the liver, very hard, but whitish, and were less than they generally are when so dense; so that it seem'd to be half-corrupted, especially as from the orifices of the bronchia,

bronchia, when cut, a whitish and turbid humour issu'd out in many places. Over the surface both of the lungs, which was contiguous to the mediastinum, where it contains the pericardium, and of the mediastinum itself at that part, was extended a thickish kind of net, as it were, of a yellowish colour, elegant in its appearance, and easily to be drawn off, as was another also, which you might have seen in the same part, over the mediastinum, of a bloody colour. There was no appearance of this kind on the left side; and the lungs there were even sound, or almost sound. In the pericardium was a large quantity of water, of the same kind with that I mention'd in the thorax, on the right side. The heart was very large, even in proportion to the stature of the man; but very lax, and contain'd polypous concretions, one of which, beginning in the right auricle, was produc'd from thence, thro' the annex'd ventricle, into the pulmonary artery; and the other, which was a little more dense, and much larger, inasmuch as it occupied almost the whole left ventricle, went on from this cavity into the aorta. From the cavity of which artery, when I drew out the polypous concretion, a cylinder of blood follow'd, very much coagulated, to the length of a span. Nor was the blood less coagulated which was contain'd in the upper vessels, at least, as I perceiv'd, by dissecting the neck. Those of the larynx, and pharynx, were turgid. The face was of a livid red. In the left external ear was blood half-concreted. I did not, however, dissect the head, being taken up with other things; so that I could scarcely open the chest, and the belly, the second day after death.

The belly was externally livid about the flanks. Yet, internally, nothing corresponded thereto, but the colon, which was in every respect sound, except that it was distended with air. The liver was so far stretch'd across the body, as to cover the whole upper part of the spleen, to which it was closely connected, and had its edge livid to a considerable extent. This lividness, which did not penetrate to any great depth, in the substance of the liver, had also ting'd the hollow surface of this viscus, to about the space of three inches. However, the liver was not very hard, but only a little whiter than usual, in its general appearance. The gall-bladder contain'd but little bile, yet, nevertheless, had ting'd the external surface of the antrum pylori, which lay beneath it: and with this bile it also contain'd twenty calculi, of different sizes, but most of them small: one of them, however, was very large, and, like all the others, internally and externally black, just as if it had been a piece of charcoal, which its rare and friable substance also resembled. None of these concretions, when applied to the flame, took fire, or emitted sparks; only they sometimes gave a kind of crack. The spleen was large, although compar'd with the stature of the man; it was lax also, and externally white. Finally, the stomach, on its whole left side externally, had both of its surfaces mark'd with certain large, and, as it were, ramifying spots, of a black and livid colour. These also appear'd internally, and were produc'd quite to the œsophagus, and had little drops of blood adhering around them betwixt the coats: so that, considering all these things, you would have no doubt about the inflammation of the stomach having been at length added.

31. If to these two long histories, I should also add long animadversions

relating either to the disease, or the method of curing it, or to those appearances found by dissection, what would the bulk of this letter be? especially as many things still remain that ought not to be omitted. It is sufficient, however, if in each of the histories you attend to two things, the one relative to the disease, the other to the dissection.

Relative to the disease is the yellow colour on that crust of the blood; which, as I remember Albertini has said to me, was the sign of the inflammation being worse, and more dangerous, according to his observations. Which remark answers also in my observations, as far as I can call to mind. Yet not only in these two, but likewise in that of the butcher, which is describ'd above (*n*), and in others besides, have I observ'd it, even when I could not join the dissection to the observation, as particularly in a drunken man, who, in that epidemic state of the air at Bologna, being seiz'd, at the same time, with a pungent pain in the breast, and an acute fever, and having us'd wine instead of blood-letting, till the fifth day of the disease, when he came into the same hospital, had blood taken from him immediately, on that day, and again on the fifth. That which was taken away on the fourth day greatly resist'd the knife, and was cover'd with a thin crust of a livid colour, variegated in its appearance, and difficult to be cut through. But that which was taken away on the fifth day, being cover'd over with a crust equally tough, but an inch in thickness, and yellow, was dissolv'd into grumous concretions, while it was turn'd up in the basin: so much did things appear to be chang'd in one day's time! This same easy dissolution of the crassamentum of the blood into grumous coagula, I mention'd also in the servant-maid (*o*), and in that butcher, in whom you will observe there was a change likewise, within the space of two days, but in a contrary order. All these persons died, as that drunken man also, of whom I began to speak, who died at the evening of the same day, on which blood had been again taken away in the morning. He always lay on his back, and was, even from the fourth day, troubl'd with a verigo and delirium, his tongue being black, his pulse frequent, and intermitting, although, these circumstances consider'd, it gave a pretty strong resistance to the fingers: and to these symptoms, a few hours before death, a stertor, and a deep respiration, were added.

But now for what relates to the dissection: You see, doubtless, by reading over these last histories also, that the injuries of the pleura, which it has happen'd to me to meet with in bodies of this kind, were very far from being of such a nature, that you could suppose them to be the cause of death. For instance, I have found the pleura somewhat thicken'd; but not to such a degree as is mention'd here in the Sepulchretum (*p*), from Riolanus, so "that it was ten times thicker than usual;" nor have I found it livid, nor shrivell'd, nor yet red from inflammation. But he, you will say, and others, have found it so: and he has even added, "that for this reason Hippocrates had written, that the carcases of pleuritic persons seem as if they had been stricken with lightning, which is to be understood of the internal parts of the thorax." And I do not deny the observations of other persons; but

(*n*) N. 19.(*o*) N. 29.(*p*) L. 2. S. 4. Obs. 14. § 2 & 3.

will even willingly confirm them, as far as I shall be able, from my own, which I shall immediately subjoin. I only at present recite those that I have already written to you. Yet, if Riolanus, trusting less to his memory, had read over again, the passage of Hippocrates, which, I suppose, is in the book *De visibus ratione in morbis acutis* (q), he would have perceiv'd, that there is no mention, or hint, of dissection in it, as the ancients are said to have suppos'd, that some pleuritic persons "were thunder-stricken," for this reason, "because after death, one side is found to be livid, as if they had "receiv'd a blow!" but would even have acknowledg'd, with Galen (r), in his exposition of that passage, that this "blackness" appear'd "in the skin," just as it did "in those who have been thus affected from a blow." Yet I will quote the passage of Cælius Aurelianus (s), which it would have been better for Riolanus himself to do, as it makes very evidently for his opinion. For when that author speaks of pleuritic patients, and of the pleura, he says this, "In patients who have died, it is often found black." Nor would I have you suppose, that he said this in reliance upon conjecture, taken from the livid appearance of the external parts of the side, in consequence of the patient's having lain upon it so long; especially if it had happen'd, that as they generally lie upon that side, in the course of the disease, so they lay upon the same side at the time of their death. Nor would I have you add to this opinion, that he did not say it of all these patients; and that he immediately subjoin'd these words, which indicate an external lividness: "In "fine, some have believ'd these persons to be poison'd." And even if you should suppose, that you could, perhaps, confirm your opinion from this circumstance, that in the age of Cælius human bodies were not dissected; first see, whether in the age of Hippocrates, which you just now objected with Riolanus, they were really begun to be dissected? then turn to Cælius, and you will perceive, that in the chapter, where he has said this, he has also produc'd arguments for the pleura from Erasistratus, who, it is certain, did dissect human bodies: at length, read over again those very words of Cælius, which I have quoted first, and you will see that they do not depend upon conjecture, but agree with observation. To which if you suppose that this one thing may be objected, I mean, the lying down, of which I spoke, of dying persons, as if the falling down of the blood into the lower parts, by distending, not only the external, but the internal vessels of the side also, and their smaller branches, had at that time brought on a livid appearance of the pleura, which was not before; I say, if you should chance to be of this opinion, first see whether pleuritic patients are us'd to lie down on the side which is pain'd; then see to this also, that the cases of pleuritic patients are not objected to you, who, like the duke of Rochefoucault (t), being compell'd to breathe, even to the very moment of his death, with his neck strait, had nevertheless both the skin and the pleura livid on one side. But you will see to these things. Nor is it necessary for me to explain the subject in this manner; because, if I had even seen that lividness, and the other appearances which Riolanus has spoken of, in the pleura of those whom I am speaking of

(q) N. 8.

(r) Comm. 1. ad t. 35. l. cit.

(s) Acut. Pass. l. 2. c. 16.

(t) Sepulchret. S. 4. cit. Obs. ult.

at present, yet, nevertheless, I should not have accounted for the death of the patients from that cause, rather than from the very great disorder of the lungs: nor, indeed, do I believe, that you will think otherwise, in regard to the histories that follow, in which I found the pleura red, and sometimes also livid, and very much thicken'd, and at other times even half-corrupted.

32. A woman, of five-and-forty years of age, was very ill with an old ulcer of one leg, and a dry scabies over her whole body, a slow fever being added to the scabies. The scabies going off, but the ulcer being still more violent, she got herself admitted into the hospital of Incurables at Bologna. But before she came into this house, foreseeing, probably, what she should be under a necessity of doing without there, she fill'd herself so full of generous wine, that she took scarcely any thing but that for the space of three days together. For which reason, on the first night that she lay in the hospital, she had but little rest, and was very hot. In the morning she was better. Yet her pulse was very quick, hard, and tense, but did not greatly resist the pressure of the fingers, nor was very large. The heat return'd at the same hour; a pungent pain came on, at the lowest true rib of the left side, which, although it was not increas'd by the touch, nor by lying down on that side, yet it was more easy for her to lie down on the right side, for this reason, because when she lay down on the left, a cough was excited, which was constantly observ'd to happen during the continuance of this short disorder. The pain went off afterwards, nor return'd any more; so that the patient seem'd to be something better, especially as the pulse, although it retain'd its other irregularities, was, nevertheless, become more slow. But, on the fourth day, she grew hot after a shivering fit, was much worse, and with her cough, which had been hitherto dry, she brought up a pus of a cineritious, and livid colour, foetid, and bloody. She could not breathe but with her neck stretch'd out. Her pulse became less, and weaker; and the expectorated matter was of a blackish colour. A slight delirium came on. The fever, in the last days of the disease, came on later than it us'd to do. In the middle of the sixth day she died, from a sudden suffocation, as it were: and this was in the autumn of the year 1705.

The thorax, on each side, contain'd a little foetid and cineritious serum: but the lungs adher'd slightly, and loosely, to the pleura. This membrane, on the left side, where the lungs had adher'd, was rough here and there, and unequal from a small and red kind of tubercles. Under the lungs of the same side (for the right lobe, being found, had none of these appearances that the left had) where it was contiguous to the diaphragm, were two false membranes, one of which adher'd to the lungs themselves, and the other to the diaphragm. That lobe was not red, but livid, and harder than the liver. Being cut into, it shew'd, in its internal substance, a pus of the same kind with that which had been expectorated, especially in certain sinusses, as it were, which also contain'd a little yellow pus. These sinusses were surrounded with no very hard, or peculiar coat; nor was there any thing in the aspera arteria. In the vena cava, and the pulmonary artery, were poly-pous concretions of a small size; and a pretty large concretion was found in the left auricle. In the abdomen every thing was found. I did not dissect the head.

33. A soldier, of a middle age, and of a moderate habit of body, except that he inclin'd to leanness, died in the hospital at Padua, about the beginning of March, in the year 1743; and as, at that time, I was explaining some things in anatomy to the students, his body was brought to me. Before the beginning of the dissection, I enquir'd, according to custom, of what disorders the patient had complain'd? Being answer'd, that, on the first days of the disease, he had complain'd of a pungent pain of one side, join'd with a fever, cough, and difficulty of respiration, till being become almost lethargic, and slightly delirious, his fingers trembling, and, on the last days, being without pulse, he died; I made no scruple to predict, to a very crowded circle of pupils, and learned men, that the substance of the lungs would be like that of the liver, that we should find polypous concretions in the heart, that the vessels about the brain would be turgid, and that an aqueous humour would certainly be found there.

The thorax being then immediately open'd there, and the head soon after, every one saw that the two lobes of the lungs, (which adher'd almost everywhere to the pleura very closely, except on the anterior surface, which also was nearly of its natural colour) when they were taken out from the body, differ'd one from another considerably. For the right lobe was greatly enlarg'd, heavy, and universally hard, if you except a little portion of the upper part, and that surface of it, which I mention'd before: it was likewise smooth, and equal, so as to represent the surface of the liver; nor did any net-work of vessels appear thereupon; and, internally, it was of that compact substance, which resembl'd the liver when boil'd, and cut into. But the left lobe differ'd from its natural state, only in these circumstances, that when it was cut into, it seem'd to be a little harder and redder than usual, with a mixture of black. But the pleura being discolour'd, on the left side, or rather whitish, on the right side appear'd to be red, almost universally, from a manifest inflammation. There was no extravasated water in the thorax: but when the lungs were cut off from the aspera arteria, (which happen'd to be very wide in this man, and was furnish'd with many bronchial glands, larger than usual, about the division) a large quantity of bloody and frothy water soon after flow'd out, gradually, from the right side, and a small quantity from the left. In the pericardium was no very small quantity of water, of a yellow colour, with a slight tinge of red. In both the ventricles of the heart were white polypous concretions, which were produc'd, from thence, into the large vessels, with black and grumous blood every-where adhering to them: and, afterwards, I even found some like the tæniæ, or tape-worms, in the iliac vessels themselves, and others like the ascarides, in the beginning of the longitudinal sinus. But I will add separately, as my custom is, what I found preternatural in the head, and the belly, besides these appearances.

While the skull was cut into, no small quantity of water flow'd down from it. Soon after, we saw the greater part of the vessels which creep through the pia mater, turgid with blood; and in the medullary substance, here and there, by cutting into it, I saw drops of blood very frequent in their appearance, some of a larger, and some of a smaller size; and in the lateral ventricles was a great quantity of a somewhat turbid water, the choroid
plexus

plexusess not being pale indeed, yet not without many vesicles; and among these some pretty large, and full of water. The fornix was lax, and the medulla oblongata was lax.

The abdomen being open'd, and the omentum, which had become adhering, by inflammation, to the beginning of the colon, being freed from thence, and drawn upwards, an unusual situation of that intestine appear'd, which, for this reason, ought not to be omitted here. For scarcely had it touch'd the liver, but it immediately pass'd downwards, below the umbilical region, from whence it was carried, obliquely upwards, to the left hypochondrium. This whole part of it only was dilated with air, and that to a very great degree.

Finally, the liver, the spleen, and the pancreas, were not natural. For the last-mention'd viscus was pretty hard: and the spleen not a little bigger than usual, and for that reason lower: the liver was also large, and, in the greater part of it, of a whitish colour; nor was it altogether sound, if you cut into it, especially on the right side: and the biliary duct thereof, in that part where it is call'd *ductus communis*, was wider than it ought to be.

34. The body of another man was brought to me, also, in the same place, before the end of March, in the year 1744. He had earn'd his living by sifting of wheat, which is very pernicious to the lungs. Wherefore, having had a pleurisy before, he died from a relapse, on the eleventh day. In this disorder, he complain'd of a heavy pain in the thorax, especially on the right side, being constrain'd to sit up in bed, in order to take his breath: he cough'd very much, but expectorated only little; and what he did spit, was viscid, and bloody: his face was red: his pulse was hard, very confus'd in its strokes, unequal, and intermittent; nor without some convulsive tremors, at some times. Blood had been taken away two or three times, and on this blood a thick polypous crust form'd itself. Having heard this relation from those who had frequently seen the man in his last disease, and seeing the belly of the carcase to be somewhat tumid, and the feet, and the lower part of the legs, to be affected with an œdematous disorder; I immediately said to those who gave me this relation, and to the rest of the circle of auditors, that we should certainly see water extravasated here, not only in the belly, but also in the thorax and pericardium: perhaps also polypous concretions about the heart, and redness, or some other disorder of the pleura, or a connexion thereof with the lungs: but that beyond a doubt we should find a turgescency in that viscus, and a hardness and density in its substance.

They began to open the chest immediately; and while this was doing, water flow'd out at the incisions of the cartilages, that join'd the ribs with the sternum: and this water was found to be turbid, and yellowish, and in considerable quantity, on both sides, but especially on the right, and had in it a kind of concretions, like those that generally swim at the bottom of a cask of wine. This water being dried up, neither lobe of the lungs was seen to adhere to the pleura; but this membrane appear'd to be somewhat redder than usual on the sides, and especially on the left, where, probably, the former pleurisy had been. The lungs, being in other parts, in general, soft, had the lower part, on the right side, hard and turgid; which being cut into, shew'd a more dense substance, of a brown colour, degenerating
into

into purple. From both of the larger bronchia, a bloody humour was press'd out, into the aspera arteria. The pericardium seem'd to be very large before it was cut into. But when it was cut into, it was evident that this enlarg'd state was not owing so much to water, although the quantity of that was considerable, and of the same kind with what was found in the thorax; as it was owing to the bigness of the heart, the parietes of which, indeed, were not much thicken'd, but the ventricles, and especially the right, were dilated, and contain'd a great quantity of black blood. This blood was certainly not very fluid, yet did not show any polypous concretion here, or in any other place, one thin crust excepted, and that in the right ventricle; so that I was not sorry to have predicted polypous concretions, and the adhesion of the pleura to the lungs, with no great degree of assurance; notwithstanding I was not ignorant, that these concretions had always been seen upon the blood of this man, when discharg'd, and those very thick and viscid; and that this adhesion was suppos'd, by most persons, where there had been a pleurisy, as I had very often found it. But if any one had been able to tell for certain, what symptoms there had been before this last disease, or at least after the first pleurisy, of a dilated heart, and an incipient dropsy in the thorax, without doubt I should have referr'd a part of those symptoms, which had troubl'd the man so vehemently, in his last inflammation, to another cause than the disorder of the lungs, which was, in fact, found by me, to be in the state I had foretold, but not to so great a degree as the symptoms requir'd. I said, that after the first pleurisy, there might have been symptoms of a dilated heart. For that it might happen to this man from a pleurisy, that is, from an inflammation of the lungs, and not very rarely to others, may be argu'd from more than one dissection propos'd above. So the man, whom I wrote of last before this (*u*); so also the old man, whom we spoke of in the beginning (*x*); had, both of them, an affection of this kind: for the first had his heart even bigger than his tall stature requir'd, and the last had the left auricle of the heart much longer than it us'd to be. So that young man, the second of those whom I describ'd among the observations of Valsalva (*y*), show'd the heart much encreas'd in its bulk. Nor indeed is it to be wonder'd at, if the passages of the blood through the inflam'd lungs being compress'd, and streighten'd, this blood, either by too much distending, or too much irritating the heart, and the vessels proper to it, should act with violence upon the parietes of the heart, or the internal substance of the vessels. And although the distension must be the greater in the cavities on the right side, inasmuch as the obstacle is then oppos'd to their unloading themselves into the lungs; yet the veins in the internal substance of the left cavities, must of course also be distended, the blood, with which the right cavities are fill'd, and stretch'd, being an obstruction to the blood likewise, which is about to return thro' the mouth of the coronary vein, from the left side. And the irritation, which is brought on from the blood being vehemently compell'd, must have been greater on the left side, as long as, the inflammation being not yet compleat, the passages through the irritated lungs are more open. Besides, in some persons,

(*u*) n. 30.(*x*) n. 4.(*y*) Epist. 20. n. 33.

one part of the heart may be more firm, and strong, than the others, in proportion, and that either originally from the birth, or after the birth; so as to make it less able than the other parts of the heart, to resist an equal cause, which may injure that viscus by irritating, or distending it. For which reason it is not to be wonder'd at, that in some, the whole heart, and in others, some particular part of it, but especially on the right side, is found to be very much enlarg'd, after violent and repeated inflammations of the lungs. And although it is in my power to confirm these circumstances by the observations of others, yet I chuse rather to point out those which I happen'd to read at the time of revising this letter, in a work of the illustrious Senac (z), who, as you will see in his treatise, explains the subject in the same manner, and affirms, that he had often seen the heart enlarg'd, after inflammations of this kind, and particularly on the right side, as it happen'd to me, in the man in question.

And, that we may omit nothing that was preternatural, and occur'd to us in dissection; this man had water in the abdomen also, in considerable quantity, like that which has been describ'd in the thorax, and pericardium. The liver was hard, externally livid, and pale, and internally variegated with frequent white particles. I was so much taken up with other affairs, that I could not dissect the head.

35. In the following year, but in the same month, and the same place, I dissected the body of a man of a middle age, and a healthy habit of body, but inclining rather to be lean than fat, at the time in which I demonstrated and explain'd the parts in their natural state, according to my usual custom, and to a crowded audience. Among the rest was present the assistant physician to the hospital. He being ask'd about the patient, and his disorder, answer'd, that he had been by trade a stone-cutter: and how liable to disorder the lungs of such artificers are, from the dust flying into them, is not only argu'd from reason, but confirm'd by observation (a). This man first had a fever, soon after that a pungent pain in the left side, and soon after this, a diarrhea to such a degree, that he had eight loose stools within the four and twenty hours, which were not yellow, nor attended with any uneasiness; and not long after this, a heavy pain in the thorax came on. He also said, that the patient was brought very late into the hospital, as the common people generally are, and that he had not been kept up at all in any house; that it was the fifth day of the disease when he came thither; and that he already labour'd under all the symptoms I have mention'd, which lasted even to the very period of his life. That the blood which had been taken away was, by reason of the particular nature of the disease, and the violence of it, become very dense, but had no polypous crust. That a spitting of matter had appear'd, with some slight tincture of blood mix'd with it, but had not continu'd long. At length, that his mind growing confus'd, and somewhat delirious, and his pulse soon after failing, which had been before tense, and without intermission, he died on the beginning of the eleventh day. And all of us having heard this account; Now, said I, you very well know, what appearances you have been accusom'd to see with me in the lungs,

(z) *Traité du Cœur*, l. 4. ch. 8. n. 3.

(a) *Vid. Aët. N. C. Tom. 5. Obs. 85.*

after disorders of this kind. You have also seen a little injury in the pleura: in the diaphragm, likewise, I have sometimes seen marks of disorder (*b*), when a peripneumonic patient had been delirious: and often water in the thorax: but much more frequently, polypous concretions in the heart, and adjoining vessels. Yet one and the other of these may certainly be wanting in this case; as so great a quantity of serum has been discharg'd by stool, and as there was no polypous crust on the blood, that had been taken from the patient, when living.

The thorax, after having said these things, was immediately open'd before them all, and contain'd no water. Both lobes of the lungs were turgid on their anterior surface, and had, also, their natural softness, and colour, in that place: but on their posterior and inferior surface, and in the left side, on almost the whole lateral surface, adher'd closely to the parietes of the thorax. Wherever the lungs had adher'd, there the pleura was unequal, and at the back was blackish, and in the left side was much thicken'd, and not of a natural colour. The diaphragm also, both in the fleshy and tendinous parts of it, to which the lungs had been connected, was of a brown colour, intermix'd with redness, and had its blood vessels much more distinct than usual. The lungs, being taken out, were very heavy, and in their whole posterior and lower surface, of a black colour, the blackness penetrating deeply into the hard and compact substance, which was found, on the left side, to be more hard, compact, and dense, to a considerable extent; whereas, on the anterior part, particularly on the right side, a soft and rare substance occur'd, and that was of a rosy colour, when cut into with the knife. In the pericardium was a little more water than usual. The vessels proper to the heart, especially on its flat surface, were turgid with blood. So also both the venæ cavæ, and the right auricle, were distended with blood. And this blood was extremely black; but without any polypous concretions: which were neither found in the ventricles of the heart, nor any where in the vessels: yet in this blood there was a kind of a semicoagulum, but this in small quantity.

The belly also being open'd, on account of the diarrhea, show'd some parts of the small intestines to be, in a manner, inflam'd. But the colon, which immediately came into sight, in consequence of its being somewhat tumid with air, was in its proper situation, except that from the middle of that tract, through which it is generally carried transversely, it was inflected downwards to the navel, from whence it mounted upwards again, but not to any considerable height. The liver was internally and externally pallid, and its bladder was empty, or at least contain'd but a very few drops of bile, which being daub'd upon paper, ting'd it with a kind of yellow, brown, and dirty colour. The spleen was both bigger, and more lax, than it us'd to be.

The dissection of the cranium, by reason of other observations coming in between, was deferr'd to the fifth day: so that for this reason, perhaps, I found all the parts of it more lax. In one surface of the falciform process of the dura mater, was a bone of an irregular figure, but smooth rather than rough, not very thin, and in its size not equal to that of the nail of the little

(*b*) Epist. 7. n. 13.

finger. Under the pia mater, in the convolutions of the cerebrum, was something like jelly : and in this membrane, the greater part of the larger blood-vessels, and the smaller branches of these vessels, were very turgid with blood, and extremely distinct, in several places. Those, also, of the plexus choroides abounded with blood, as did those which creep through the medulla oblongata : nor were frequent bloody points wanting, wherever you cut into the medulla of the brain.

36. A young man, of twenty-five years of age, and of a palish complexion, having been before troubl'd with strumous complaints, and, as was said, having labour'd under a previous lues venerea, was, after being very hot from violent exercise, for he was a servant, seiz'd with a shiv'ring, and fever, attended with a pungent pain, which he said he felt in almost his whole breast, properly so call'd, but more at the inferior part. He had pain also in his back, and even in the whole circumference of his body ; so that wheresoever you touch'd it, there, he would say, the pain was considerably encreas'd by your touch. He could lie down in no posture but on his back. His pulse was quick, and small : he had no thirst : he had an internal heat : his respiration was difficult : his expectorated matter was yellow and red. On the fourth day, he had some bilious stools : and on the eighth day, after having made a great quantity of water, and been moist with the sweat of death, he died about the end of the same day, in the hospital at Bologna, which I have so often mention'd, in the middle of January, in the year 1706.

In the right cavity of the thorax was a turbid and sanious serum. And in both of them, the lungs adher'd, almost universally, to the parietes, even those which are made up of the diaphragm ; but the left lobe, on its anterior surface, by filaments only ; yet this lobe, and the right also, in almost their whole circumference, were not only very closely connected, but, in some measure, grown into one substance, as it were, with the surrounding surfaces, by means of a thick kind of membrane being interpos'd. This membrane was white, tenacious, and in some places, on the right side, scarcely less than half the thickness of the ring finger ; for on the left, it was much less thick and white ; and follow'd the lungs, which we were oblig'd to pull away with violence. Yet if you separated this very membrane from the lungs, which was easy to do, you plainly perceiv'd that their membrane lay beneath, in its entire and uninjur'd state. For which reason, you would have said it was the pleura, if you had not observ'd that this membrane remain'd in its natural situation, on the right side, found and whole, through which the neighb'ring intercostal muscles were seen, and they rather of a red colour. Yet on the right side, in the place of the pleura, another membrane appear'd, similar to that which had been drawn away with the lungs already, except that it was not quite so thick ; and if you drew away this other membrane, you then saw that the intercostal muscles appear'd white under it ; so that the pleura might seem here, indeed, to be made thicker from the violence of the disease.

But be this as it will, the pleura, where it cover'd the triangular muscle of the breast, on the right side, was certainly half-corrupted, and was torn by a slight friction of the fingers. This muscle was inflam'd : and the fleshy part of the diaphragm, which was very near, on each side, to its center, where the

lungs

lungs had adher'd, seem'd like an inflam'd surface, in some places. But the lungs had the following appearances: the left lobe, in one place, shew'd a white substance, consisting, as it were, of tartarized granules, but in all the other parts of it almost, was only hard, dense, and heavy; yet the least so, on its anterior surface. But the right lobe was even more hard, dense, and heavy, than the left.

In the pericardium was water, in a somewhat larger quantity than usual, and turbid. A polypous concretion of a white, and yellowish colour, but lax in its consistence, was produc'd from the right ventricle of the heart, through both the orifices of that cavity. Nor were the concretions much unlike this, which pass'd through both the orifices of the left ventricle. Those which went, from hence, into the pulmonary vein, and from the right ventricle, into the pulmonary artery, being divided into branches, imitated the divisions of these vessels.

The belly being open'd, the stomach and the intestines, especially the colon, appear'd to be much distended with air. The lower part of the spleen was ring'd with a peculiar blackness, just as if it had begun to degenerate into a gangrene, from inflammation: and this blackness continu'd to the depth of an inch and a half. On the other hand, the liver was whitish, and at the same time very large: and in the gall-bladder, together with a little bile, which was of a white colour, degenerating into yellow, I found more than three-score and ten calculi, the larger ones of which, being in number very few, did not exceed a bean in magnitude, whereas the least were not less than a pepper-corn: the former, in some measure, approach'd to the figure of an oval, but depress'd in one part; and the others, in great measure, resembl'd a cubical figure. Internally, they were moist with bile, and seem'd to be made up of a kind of granules. This construction was shut up, on all sides, by a double crust at least, which was, in most places, greenish, but, in some, partly white. All of them preserv'd the flame which they had once caught, and sparkl'd now and then, with a kind of slight crackling noise. The right kidney was very lax. The trunk of the great artery, both in the belly, and from thence, through the thorax, quite to the curvature, seem'd to be narrow, in proportion to the size of the body, which was in other respects pretty large, and of the greater part of the viscera. The head I did not touch.

37. It has never happen'd to me, to see a greater injury of the pleura, in inflammations of the thorax, than is related to you in this history, which I purposely reserv'd to the last place. Now, which do you believe, that this young man died of the injury of the pleura, or the inflammation of the lungs that was join'd with it? If you read over again all the observations both of Valsalva and mine, and compare them with those of other, not only ancient, but modern physicians, whom I shall mention below, you will readily perceive, that it is far more easy for us (if it was absolutely necessary to follow one or the other) to agree with the opinion of those, who teach that a mortal pleurisy consists in the inflammation of the lungs only, which I have often seen, than with the opinion of those, who say that it consists of the inflammation of the pleura only, which I never found. And, indeed, Hippocrates, to pass over Praxagoras, Herophilus, and Euriphontes Gnidi-
who,

who was, perhaps, older than Hippocrates, and others, who, according to the testimony of Cælius Aurelianus (c), as he also produces their arguments, taught, "that in pleuritic patients the part affected was the lungs;" Hippocrates, I say, in the book entitled *De locis in homine* (d), not only expressly places the seat of a peripneumony in the lungs, but of a pleurisy also; that is, of the latter, when one part of this viscus is tumefied, from a quantity of hot humour flowing into it; and of the former, when both parts of it are affected in this manner. I do not, however, contend that this distinction should be recall'd into use: I only say this, that it was better (as Demetrius Herophilus (e) had done) to make use of it, than to make obscure what truth there was in this passage, on account of other passages in Hippocrates. Yet whether Martianus has done this, I shall not enquire here. But you may see, even in the Sepulchretum itself (f), when he disputed of this same passage of Hippocrates, whether he with justice affirm'd, contrary to Joubertus (g), in dependance upon "his having open'd an infinite number of bodies, "that it rarely happens for one part of the lungs to be inflam'd, while the "other remains unhurt," or "that the pain does not arise on account of "the lungs being inflam'd," but of the side: and although he has objected to the observations of those, who asserted their "having always found the lungs "to be injur'd in a pleurisy;" although he has objected, I say, that it was not to be wonder'd at, if they observ'd this at "Rome," where "the pleurises and peripneumonies are almost all of the number of those of which "mention is made in this passage of Hippocrates;" he, nevertheless, immediately subjoins, "that carcases of pleuritic patients are observ'd every day "at Rome," in the hospital of the Holy Ghost, that is to say, of such persons as are brought in thither "from the country about Rome, in whom the "side is found to be injur'd, and corrupted," without making any mention of the lungs. But I would have you call to mind those observations which Hoffman (h) speaks of, about these times, as being made by Petrus Servius, in the same hospital of the Holy Ghost, "even in three hundred bodies of "pleuritic patients," in which he "always saw a lobe of the lungs to be "affected, and fill'd with matter; and the pleura either not at all injur'd, "to the appearance of the senses, or only slightly affected in some measure." Then see how much more all our observations agree with these, than with the former; which certainly, left Martianus excite any scruple in your mind, were made in different places, and at different times. The same will shew, separately, and not as Joubertus does, in general, whether it be more rare, that one only, or that both lobes of the lungs, are inflam'd; and, in like manner, whether the pungent pain be always owing to the inflammation of the side. Which is not only found not to be inflam'd, at some times, but even is then found not to have any connection with the inflam'd lungs: a circumstance that differs, in many respects, from the observations of Diemerbroeck (i), and but little agrees with the determinations of some more

(c) Acut. Pass. l. 2. c. 16.

(d) N. 24.

(e) Apud eund. Cælium, l. cit. c. 25.

(f) Schol. ad § 5. Obs. 14 hujus Sect.

(g) Sect. ead. Obs. 24.

(h) Medic. Rat. Tom. 4. P. 1. S. 2. c. 6.

§ 2.

(i) Vid. Epist. 20. n. 58.

modern writers, as you are not ignorant. And if you look to some of our observations, describ'd to you in the sixteenth letter (*k*), you will find, that the pleura was, sometimes, not quite free from inflammation, and yet there was no pain in the side; to omit enquiring here, whether the pleurifies "without a punctorious pain of the side," observ'd, according to Etmuller(*l*), by more than one author, are evidently to be refer'd to this class.

38. But now, if you attend to all our observations, and those of Servius, at the same time, you will immediately understand how easily you may assent to the opinion of those, who think, that, in a mortal pleurisy, "the pleura alone is frequently inflam'd," the lungs themselves being unhurt; although Sydenham seems to be of their opinion (*m*), as he thinks, "that the peccant matter is deposited upon the pleura, and sometimes also on the lungs." But how differently have those physicians judg'd, who have, even formerly, investigated by anatomy, what happens most frequently; as Coiterus(*n*), for instance, whose whole words I shall copy here, not only because they agree with our observations, but also because I have look'd for them in this section of the Sepulchretum without effect. "In the autumn of the year of our Lord 1563, coughs, peripneumonies, and malignant pleurifies, spread all over Italy, like epidemical diseases, and destroy'd great numbers; and in the bodies that I dissected, I found the lungs, as it were, universally turgid with blood half-putrefied, and indurated to a surprizing degree. That space of the thorax which was not fill'd up by the lungs, was full of a water not unlike that which has been us'd to wash away blood: and the heads were fill'd with a great quantity of limpid water." You see, that, although he mentions other things, he does not mention the pleura. But you may, in return, object Vesalius(*o*) to me, who is, in like manner, taken no notice of in the Sepulchretum, and who, when speaking of two women, one of whom, he conjectur'd, "had died of a pain in her side," and the other "of an inflammation, on the third day," makes mention of the pleura, but not of the lungs. For he writes, that, in the former, "the inflammation had occupied almost the whole left side of the membrane which surrounds the ribs internally, but particularly at the root of the ribs." And in the latter, "that it had occupied the whole posterior part of the thorax, at the entrance of the vena sine pari, and according to the distribution of its branches, and had afforded him an excellent specimen, in order to distinguish the essential properties of a disease of this kind in the side." I will not, however, on this occasion, say, that Vesalius, who was then engag'd about another subject, and mention'd these things only by the way, might have so much the more easily omitted to mention the injury of the lungs, as at that time this controversy was less agitated: but if you will have it, that the lungs, in these two women, were unhurt, I will grant it you, provided you at the same time grant me also, that in all those whom Coiterus points out, and certainly in much greater number, the pleura was without injury, or, at least, had only such a one as might be easily neglected,

(*k*) N. 30, 31, 40.

(*l*) Prax. l. 1. S. 18. art. 9.

(*m*) Obs. Med. circa Morb. acut S. 6. c. 3.

(*n*) Obs. Anat.

(*o*) Epist de Rad. Chy n.

or overlook'd. And here we enquire what happens in general; not what sometimes happens. Nor indeed have I denied in the former letter (*p*), that some observations now and then happen, which are similar to those of Vesalius. And even so far from this, that I would have added another observation, of Harderus (*q*), for instance, which is, in like manner, omitted in this section of the Sepulchretum, if, besides that there was another cause of death, in the cortical part of the brain, which was purulent, he had not shown a want of clearness, and precision, in making out the situation of a quantity of pus, which he found extravasated into the cavity of the thorax; for situations of this kind ought to be accurately defin'd, nor is the same purse, or bag, in which pus is, or has been, contain'd, to be at one time referr'd to the pleura, and at another time to the lungs, according to the pleasure, as it were, of the observer; though we see this to be sometimes done. The observations, therefore, upon which no doubt falls, of very considerable and grievous injuries of the pleura in a pleurisy, without the lungs being affected, I do not deny; but I say that they are, without doubt, very rare, if they are compar'd with the immense number of those, which Coiterus and Servius have made, and Barthol. Vicarius (*r*), who observ'd the same thing as Servius, in twenty pleuritic bodies, and Gagliardi (*s*), who took care to have bodies of pleuritic patients dissected, to about the number of thirty, and Nannius (*t*), and, to say nothing here of myself, or of others, whom I shall mention below, in fine, Valsalva, who dissected a great number. Nor did any one of these ever light on a very considerable injury of the pleura, or to any great extent, at the same time that they found the lungs to be unhurt, notwithstanding they made so great a number of dissections.

39. And indeed, the inflammation of the pleura, join'd with an inflammation of the lungs, is not so frequently found in dissected bodies, as some gentlemen, in other respects very learned, seem to imagine. But whether this be true, or not, can be only properly determin'd, when a great series of observations is taken into consideration. And if you well weigh what has been said by Coiterus, Servius, and Vicarius; you will have a great number of observations to add to those of Valsalva, and to mine. To which you will also add, besides others, these that are read in the Sepulchretum. Zwinger (*u*) and Dilenius (*x*) saw the lungs pretty hard, and already affected with a gangrene; and when they describ'd the other parts, which were diseas'd in those bodies, do not so much as mention the pleura; and the first expressly adds, that the lungs, in a patient, who, with an intolerable pungent pain in the side, had cough'd up a great quantity of blood, "were, nevertheless, no "where connected to the pleura;" and another had been carried off by an exquisite pleurisy, which degenerated into a peripneumony. Lanzonus also (*y*) found, in the body of a person who died of a violent pleurisy, an abscess of the lungs "which had been the cause of the disease, and death of the patient;" but not one word of the pleura. And, indeed, in the epidemical

(*p*) n. 57. 58.

(*q*) Apiar. Obf. 53.

(*r*) Vid. in Obf. 87. Cent. 1. N. C.

(*t*) cit. supra, ad n. 28.

(*s*) Vid. Epist. 20. n. 57.

(*u*) Eph. N. C. Dec. 3. A. 5. Obf. 8.

(*x*) Ead. Dec. A. 10. Obf. 241.

(*y*) Ibid. A. 5. Obf. 122.

constitution of the same year, as from the symptoms of a pleurisy, the greater part of the physicians judg'd the pleura to be inflam'd, others disputing against it; he having open'd a body, "in order to determine this great dispute (z)," found one lobe of the lungs affected with an erysipelatous inflammation, tumefied, and of a yellow colour, with spots, but "without any injury of the pleura."

The celebrated Fischer also (a), in another epidemic state of air, having open'd a body, that he might see "what was to be determin'd in regard to the controversy, so warmly agitated by some persons, concerning the "seat of inflammation," says, that he found no other appearance than the inflammation of the right lobe of the lungs, and polypous concretions in the larger pulmonary vessels. Nor does the most excellent Gesner, in that constitution I mention'd above (b), which was fallacious indeed, but not without a punctorial pain in the sides, or under the scapula, after having dissected several bodies, relate, that he found any injury of the pleura; notwithstanding he says, that he found the lungs to be inflam'd, and otherwise diseas'd, both internally and externally. Finally, to omit others, I cannot pass by the illustrious Haller (c), who, although he has given us four observations of his own, made upon the pleurisy, and peripneumony, yet in one only of them, he has said, "that there were marks of inflammation in the "pleura;" but in all of them, he says, that the lungs were either diseas'd with a great abscess, or had their weight and bulk much increas'd, from blood, that had distill'd into their vesicles, and cells, or from a white humour, that was forc'd into their substance; and that they were partly hard and solid, which, as I have shown you above (d), frequently happens in the inflammations of this viscus. And this state of the controversy being consider'd, you very well perceive, that the inflammation of the pleura, join'd with an inflammation of the lungs, is less frequently to be found, than a physician of our age, who was deservedly very eminent, seem'd to believe, when he said, "that a peripneumony rarely began alone, but that it succeeded to a pleurisy, and paraphrenitis." Which words call to mind the passage of Hippocrates, that is thus render'd into Latin by Duretus (e): *Peripneumonia pleuritidis succedanea, tutior est primigenia*; "A peripneumony "that comes after a pleurisy, is less dangerous than when it is the original "disease;" which passage has much tortur'd the wits of the interpreters, and physicians, not only for other causes mention'd by Cælius Aurelianus (f), and Ballonius (g), but particularly, because it is written in the aphorisms (h): *A pleuritide peripneumonia malum*: "A peripneumony after a pleurisy is bad." And Martianus, indeed (i), and Senertus (k), to whom others perhaps might seem to be too bold in their alterations, and emendations of the text, have thought of a method by which, without making any change in the words, they suppos'd that the passage might be very properly understood, if, as

(z) Ibid. Obs. 120.

(a) Cent. 9. N. C. Obs. 80.

(b) n. 14.

(c) Opusc. Pathol. Obs. 13. & seqq.

(d) n. 20.

(e) Coacar. Prænot. l. 2. c. 16. n. 28.

(f) Acut. Morb. l. 2. c. 25.

(g) Annot. 6. ad Consil. 27. l. 1.

(h) Sect. 7. Aph. 11.

(i) Ad Coac. Sect. 2. n. 277.

(k) Medic. Pract. l. 2. P. 2. c. 16.

Senertus says, we consider, that when a part of the peccant matter having been previously deposited upon the pleura and parietes of the thorax, the remainder is not only of consequence, less in its quantity, but is also carried with less impetus into the lungs; or if, as Martianus supposes, the word ἀσθμαλις ἐν τῇσι be not understood in such a sense, as to signify that the peripneumonies are more safe, or less dangerous, which is generally suppos'd by the commentators, but that they are *more stable*, that is, less mutable into any other disorder. But I am prevented from following the first of these interpretations, by the aphorism just now mention'd, because I do not see, how I can sufficiently reconcile the one with the other: and I am prevented from following the other, by the constant use of this word, and those of a similar kind, in the *Coacæ Prænotiones*, where they do never, as far as I have been able to see, signify a greater stability, but a greater security; that is less danger (*l*). And, these things being so, it came into my mind some time ago, to enquire whether it might, perhaps, be allow'd us to cast off from the word in question, that first letter, which has the force of a privative, as if it had been added by the carelessness of copyists or librarians; so that by means of a change, which is the least that is possible, as the case seems to require, we should not read, as we do at present, that those peripneumonies which succeed to a pleurisy, are more safe, but that they are more dangerous: or if this could not be allow'd us, whether we might not follow the reconciliation propos'd by Petit (*m*), or at least approv'd by him; I mean, to understand the aphorism, of the peripneumony which is added to a persisting pleurisy; and the passage of the *Coacæ Prænotiones*, of the peripneumony into which a pleurisy is chang'd. But you will see, whether those two peripneumonies are compar'd together, in that passage, or whether this other, into which a pleurisy is chang'd, is compar'd with that, which is the original disorder. And if it be so, as it evidently is, we then revert, without doubt, to this enquiry, what can be the reason, that Hippocrates pronounces those peripneumonies which happen to patients that are already debilitated by a pleurisy, and the cure of it, to be more safe than those which attack strong, robust, and healthy men, without any preceding pleurisy? For you will see in Ballonius (*n*), that the former are judg'd to be "mortal;" and that not from reasoning only, or the authority of Galen, but also from examples, which he produces, of the death of "the queen of Navarre," from that cause, and of "Madame Dupuy:" to which, physicians have since added many, and many other, fatal examples, and not long ago, our celebrated Gianella (*o*): so far am I from being able to believe, that those peripneumonies, if we take into consideration what more frequently happens, are, universally, "more safe than these disorders when original."

40. But to return from these peripneumonies which succeed to a pleurisy, to those which are join'd together with it, although these do not happen very often, as you have already sufficiently seen, yet that they do now and then

(*l*) Vid. apud Duret. cit. cap. n. 17. cui adde n. 16. & cap. 17. n. 1. Adde cap. 15. n. 4. & l. 1. n. 149.

(*m*) Comment. in Aret. de Morb. Acut. l. 1. c. 10.

(*n*) Annot. 6. cit.

(*o*) De Success. Morb. l. 2. c. 6.

occur, not only my observations, but the observations of others, demonstrate. At least, it is very certain, that those very rarely occur, with which a violent inflammation of the pleura is join'd. Even that fellow-citizen of mine, Vincent Baronius, is a witness, in preference to others, who wrote a volume expressly on the subject of these two disorders being join'd together, and first gave the name of pleuripneumony to both, or at least so confirm'd it, that it is now consider'd as the most proper, by some of the most modern physicians: and I do not know, why his observations, which have been printed ever since the year 1636, have not been copied into this section of the Sepulchretum, especially as some other observations, besides what I pointed out above (*p*), are not only set down once, but twice; as, for instance, those which are found to be the same, both in article the seventh, observation the ninth, and article the second, observation the fortieth; and those also which you have in the last scholium to observation the thirty-third, and in the ninth article of the appendix to observation the twenty-fifth; and those which are in the fourth article of this appendix, and in the second of the scholium to observation the thirty-eighth. Baronius, then (*q*), having, at a time when the pleuripneumony was spread about epidemically in our regions, dissected three bodies that died of this disease, in the hospital of his native place, could "find no traces of inflammation, or tumour, in the membrane that covers the ribs, internally, or any abscess in their side, except in one woman," in whom, however, he did not find this membrane inflam'd, but "tabid;" so that it follow'd the closely-adhering lungs, when they were pull'd away. And from the description of the disease of each separate person, which he premises to the dissection, it appears, that all of them had been tormented with an acute and pungent pain of the side: and, indeed, he has subjoin'd to these the observations of Platerus, and Zecchius, as being similar to his; the first of whom found "only a livid spot" in the pleura of two pleuritic patients, and the lungs themselves, which were affix'd to it, to be rather affected with disease; and Zecchius found, in many bodies, that the lungs, and not the pleura, were injur'd, as you will even find observ'd in the Sepulchretum (*r*); although in his last treatise *De Lateris Dolor*, which, as it is subjoin'd to the *Methodus de Urinis*, so also is prefix'd to that *Consultatio* which was last publish'd at Venice, the same Zecchius writes, that in pleuritic bodies, with a great disorder of the lungs, the pleura was found "to be entirely uninjur'd, at some times, but sometimes a little chang'd." To this add Jacotius (*s*), whose words are these: "By experience, in the dissection of pleuritic bodies, I find that the pleura is rarely tumefied:" and, not to insist too often upon the dissections of Valsalva, and mine, add those three hundred of Servius (*t*), in which he found the pleura either not at all affected with disease, or "only slightly, as it were, tainted." But as you will believe, when I shew'd above (*u*) the rarity of extensive and violent injuries of the pleura, where the lungs are found, or of the inflammation of that membrane, join'd with the inflammation of this viscus, that I am, at least, not in the

(*p*) N. 28.(*q*) De Pleuripneum. l. 1. c. 1.(*r*) Sect. hac Obs. 20. § 29, & 1.(*s*) Comment. in Hipp. Cœc. Sect. 2. l. 1. aphor. 1.(*t*) Supra n 37.(*u*) N. 38, 39.

number of those who have contended, "that no pleurisy is excited from the membrane which covers the ribs, internally, being inflam'd," most of whom are mention'd by the celebrated Vitmannus (x); so here, in like manner, you will believe, notwithstanding I demonstrate, that, in the dissection of a great number of bodies, no considerable inflammations of the pleura were join'd with an inflammation of the lungs, that I do not, for this reason, necessarily deny this case ever to happen. For I am not unmindful of those cases that are related in the Sepulchretum: and to them I can add others; as those, for instance, which are pointed out by Gagliardi (y), and that in a great number too, where the inflammation was extended from the lungs to the pleura; or when Hoffman (z) says, that he had seen "the pleura inflam'd, and sphacelated," adhering to the diseas'd lungs by small abscesses. But Hoffman has added the word *etiam* (as if he had seen this appearance sometimes only) after having said, in general, what he had most frequently seen, in the following words: "In dissection the lungs are found to be inflam'd, and hard, like the liver, and fall to the bottom in water:" which he also confirm'd by a very clear observation (a), in describing their vast weight, distension, and hardness, because they had "their vesicles stuff'd up, as it were, with a thick, red, fleshy substance: and though he omitted no other of the internal parts of the thorax, he did not so much as mention the pleura. And Gagliardi, having dissected to the number of thirty, as is said above (b), in some, found the substance of the lungs to be so chang'd into the likeness of the liver, that in a certain chirurgical student, when cut in pieces, they could not be distinguish'd from the liver of the same body: in others, he found it black; and in some, promiscuously affected with both those disorders, the first of which he call'd *phlegmonosus*, and the other *gangrenosus*. The most excellent Senac (c), also, though he says, in general, that the substance of the lungs "was indurated in pleurisy, and form'd a mass like to the substance of the liver," yet, in another place (d), excepts the pleurisy of a particular constitution of air, in which he accuses "a gangrenous principle," and relates what he had observ'd in the patients when living, and in their bodies after death. By comparing the two writers together, you will see what difference there was betwixt the state of the disease at Paris, and at Rome. For Gagliardi ascribes to each of those three disorders their peculiar signs, and remedies. But as he pretty clearly shews the progress of the phlegmonose kind to suppuration, in those who had died somewhat late in the disease; so you will find, that perspicuity is wanting in the description of the gangrenous kind, and of that which is compounded of both; for it is not possible to conceive from thence, whether those parts of the lungs, which were seiz'd by a gangrene, had been affected with a phlegmon, or with an erysipelas, or with neither kind of inflammation. And the progress of that liver-like substance into suppuration, you will see, is also remark'd by me, both in this (e) and in other letters (f); and, in like

(x) In Procem. Mechanismi venæ Azyg.
Pleurit. causæ.

(y) Cit. supra, ad n. 28.

(z) Cit. ibid.

(a) 1. in Enarr. Morb. cap. ibid. cit.

(b) N. 38.

(c) Traité du Cœur, l. 4. ch. 3. n. 2.

(d) L. 3. ch. 8. n. 9.

(e) N. 17.

(f) Epist. 6. n. 11.

manner, the blackness in that same hard and dense part (*g*): and that Valsalva had seen it in this very part, when he describ'd the lungs of an old man (*b*), as being "black, and affected with inflammation, hard, and very compact," who died on the third day; and when he describes a part of the lungs of a woman (*i*), who, during the time of her disorder, had lost all her strength, and whose pain afterwards remitted, "as being brown in the indurated lobe, and seiz'd, in some measure, with a sphacelus;" and also when he describes the lungs of a man (*k*), who died on the fifth day, as "very much indurated, verging to a greenish colour, and distinguish'd with black spots." But Valsalva never found the lungs of peripneumonic patients, as far as I know, to be black, except where they were indurated; nor I, except in one man, of whom notice is taken in the thirteenth of the *Epistolæ Anatomicæ* (*l*); although I examin'd them in a cursory manner, as I was chiefly attentive to the head, and I remember that they were exceedingly injur'd: but, nevertheless, whether this blackness was from a gangrene, or from blood, which had not so thoroughly stagnated in their vessels as is requir'd to constitute a gangrene, I have no remark to determine: nor do I understand, whether they were hard, or relax'd by a sphacelus, and soft, when Lancisi, in that epidemic peripneumony, at Rome, wrote (*m*), "That the precordia were red, quite to the diaphragm, and black from blood that was collected in them;" that is, as he speaks below (*n*), "red, and attack'd with the beginning of a sphacelus." But however this might be, do all these disorders of the lungs, in making mention of which, you will perhaps think that I have digress'd from my purpose, seem to you to be of such a kind, that if they be sometimes join'd, even with violent injuries of the pleura, you ought to impute the death of the patients to the latter, rather than to the former? Certainly it did not seem so to Lancisi, who wrote to me (*o*), that even those, in whom the branches of the vena sine pari, on the side that was first inflam'd, "had form'd themselves into varices, had died from a violent pleurisy; but such a one, as degenerated into a peripneumony, and an inflammation of the diaphragm." And indeed the truth forc'd these words from Riverius himself, at the same time that he defended a contrary opinion, which you may also find in the *Sepulchretum* (*p*), and ought to be sufficient for us: I mean, "that very violent pleurisies, which are accusom'd to bring on death, for the most part degenerate into a peripneumony." But that very excellent physician Trillerus (*q*) universally asserts, that in a true pleurisy, "not only the pleura is affected, which has been hitherto wrongfully suppos'd; but that the substance of the lungs themselves is at the same time infested, which anatomy, the only eye of medicine, has very clearly prov'd; and that there is no such thing as a true acute pleurisy, without a peripneumony." In fine, to omit others, in this place, it will be sufficient that the most experienc'd anatomist, Haller (*r*),

(*g*) *Supra*, n. 4. & 24.

(*b*) *Epist.* 20. n. 33.

(*i*) *Ibid.* n. 41.

(*k*) *Ibid.* n. 45.

(*l*) *N.* 23.

(*m*) *Epidem. Rheum. A.* 1709. c. 2. n. 6.

(*n*) *C. 4. S. 1. n. 7.*

(*o*) *Dissert. de Vena sine pari.*

(*p*) *Sect. hac Obs.* 14. §. 4.

(*q*) *Vid. Commenc. Litt. A.* 1741. Hebd.

2. n. 2.

(*r*) *Opusc. Pathol. Obs.* 13.

denies,

denies, "that it ever seem'd to him, that the pleura alone, by its inflammation, had destroy'd any person."

41. Nor am I afraid, lest while I am detain'd thus long, in this controversy, about the true seat of pleurifies, you should, perhaps, in imitation of the empirics, with whom Galen (*s*), in regard to this question, acted very mildly, think that I make all this parade of words about a very useless enquiry. For if the dogmatists, at that time, "defended themselves against the empirics by a very improper answer;" at least in our times, if you should consult two very celebrated physicians among the dogmatists, Boerhaave (*t*) and Hoffmann (*u*), you would not easily suppose, that those empirics had known by experience alone so clearly, distinctly, and accurately, the same distinctions of cure, as these two gentlemen, and particularly Boerhaave, led on by reason and anatomy, have propos'd. And you will be chagrined to find, that there was in our age, a senior physician, who asserted, that every one made use of the same method of cure, whether the pleura is occupied by the disease, or the lungs are affected by it; that is to say, forgetting even the very distinction, which they themselves do not attempt to deny, who endeavour'd to extenuate other circumstances; I mean, that one method of cure is requir'd, at least, if the disorder verges to suppuration, when the pus is in the pleura, and the muscles that lie upon it; and another, if it is in the lungs; and that it is to be drawn out from one, and from the other, by quite different methods. Yet it does not escape me, that there have been other physicians, in our age, and those much more skilful than this gentleman, who have taught, that almost the same, and indeed in every respect, a similar method of cure is suitable to both diseases. These, however, either judg'd that the seat of both diseases was in the lungs, or that both of them were join'd together, from which it is easy to conceive, what remedies they pronounc'd to be common to both diseases, and with justice. But the other, in order to have it to say, that all the labour of anatomists, in this disquisition, was to no purpose, affirm'd the same thing of the whole method of cure; as if this, at least, were not true, that the physician is more solicitous about the disease, and the speedy administration of the most important remedies, who knows, that its much more frequent seat is in the lungs, and its more rare situation in the pleura. You, however, if I rightly conceive of you, as having a mind desirous of knowledge, and preferring the finding out that which is true, to other things, will not only not be satisfied with those things, which, I said, I had hitherto seen in regard to this disease, but will perhaps wish moreover, that as I have so often observ'd the membrane of the lungs to be found, and entire, so I had, in like manner, found it to be sometimes affected with a kind of erysipelas, the deeper substance of it being quite unhurt, and by no means stuff'd up, that you might have all the seats of these inflammations of the thorax ascertain'd by me, from anatomy.

But do not be displeas'd that I have left something to others, who are more diligent, or more successful, than I am: and in the mean while, from

(*s*) De Loc. aff. l. 3. c. 2. (*t*) Aphor. de cogn. & cur. Morb. tum. §. 849. & seqq. tum. §. 886. seqq. (*u*) c. 6. cit. supra, ad n. 28. §. 2. & seqq.

that feat which I have confirm'd to you, to be the most frequent of all, let it be sufficient for you to understand many things, but these in particular, much more easily. First, why an empyema is not so frequently the consequence, as it must have been, if the pus were collected in the pleura, from which there is naturally no exit outwards. Secondly, how it happens that so great a quantity of pus is expectorated by some pleuritic patients, or is pour'd out into the cavity of their chests, which, if it proceeded from the pleura, a slender, and thin membrane, might well seem to be "a great miracle indeed," to others, as it did to Aretæus (*x*). For that it becomes so thick from inflammation, as to contain a very great quantity of matter, has never happen'd either to me, or to Valsalva, or to any of the anatomists, to see for a certainty, who, as I have said above (*y*), have made far the greatest number of observations. And consider now, whether it be just to add the fat to the pleura, that we may suppose such a quantity of matter not to be wanting. For the external fat relates to the bastard-pleurisy, and not to the true and latent one, of which we speak. And how little in quantity the internal fat is, in persons who are not of a fat habit of body, you are by no means ignorant; for I have acknowledg'd already, in another place (*z*), in concert with that very diligent physician Trillerus, that persons of a fat habit of body are not so liable as others, to a pleurisy. Finally, in the third place, if it be taken for granted, that I have prov'd which is the most frequent feat of this disease, it also may be easily conceiv'd by you, how a spitting of blood shows itself so often, even in the very beginning of this disorder.

42. I am not ignorant how many methods of explaining this matter have been invented by ingenious men, although even the inflammation should be suppos'd to be confin'd to the pleura alone. The most ancient of which, is that of Erasistratus, whose words are handed down to us by Galen (*a*), when he disputes against it. Which mode of explication, although follow'd by Sennertus (*b*), without acknowledging the author, yet most would now be strangers to, if a learned man among the Italians, and, at the same time, much to be commended for his treatment of the pleurisy, had not plac'd it in a proper point of view, and even render'd it probable; the words of Erasistratus being not only accommodated to the circulation of the blood, as it is now known, but also particularly explain'd by the bronchial artery, which was known to Erasistratus and Galen, in like manner with the vein corresponding to it, as the words of both sufficiently shew (*c*): in which explanation, nevertheless, you may have room to wish for this one thing, at least, if not many others, that by the "concave artery," the bronchial should not be understood, but the aorta; for the vein also "is call'd cava for this very reason," because it is "very large," as is asserted by Galen (*d*), in another place. And among the modern methods of explaining this bloody expectoration, to pass over the other ancient ones, which Schneider (*e*) has

(*x*) De Cauf. diuturn. Affect. l. 1. c. 9.

(*y*) n. 38. & seqq.

(*z*) Epist. 20. n. 10.

(*a*) De Loc. aff. l. 5. c. 3.

(*b*) cap. 16. cit. supra, ad n. 39. qu. 3. in fin.

(*c*) cap. 3. modo cit. infra medium.

(*d*) De Venar. &c. dissect. c. 2.

(*e*) Dissert. de Pleuripneum. c. 1. § 33, 34. already

already sufficiently refuted, and to take no notice of the ramifying veins, that go from the pleura into the ramifying veins of the lungs, which are pointed out by some persons, in relation to this question; I say, to take no notice of these branches, except that if they were even constant, whatever they might carry in would by no means stagnate in the lungs, inasmuch as it must always be carried to other parts, proceeding from the more narrow, perpetually, to the wider veins, together with the other part of the blood; I cannot, however, omit to commend that mode of explication, whatever was formerly related to me by Lancisi (*f*), by means of tubuli discover'd by injections, betwixt the vena sine pari and the aspera arteria, as it may probably sometimes take place.

But although I approve the ingenuity and diligence of this excellent man, yet certainly as often as ever I know, that the lungs themselves are affected with inflammation, I shall not easily seek for the cause of the expectorated blood in the pleura; nor shall I leave the broad and strait way, to pursue narrow and oblique paths, especially as long as I shall call to mind those observations, which were formerly propos'd by Nanni, in a dispute that he had with me, in a friendly manner, as he was wont to do, in the Academy of Sciences at Bologna, which are related, with too little fulness, in that antient writing, from which alone, the no less diligent, in other respects, than learned man, who now is deservedly one of the select body of that Academy, could copy them into the Commentaries thereof (*g*). For Nanni related them thus, as I, for the sake of my memory, took them down on the same day: In that epidemic state of pleurisies, he found but one or two, who had the pleura only diseas'd, and these died without any spitting of blood, as you will read in the Commentaries; but that the others (which you will not find there), in whom he found the lungs to be principally diseas'd, which were in great number, had all died with previous spittings of blood. Now therefore you see, both why he thought it necessary it should not be omitted by him, that in the two former bloody expectorations were wanting, and at the same time, what seems to be pointed out by me, from his observations, in regard to the present subject of dispute.

43. I remember that on the same day, I communicated to the Academy what I had seen in two young men, in the hospital of St. Mary de Vita, but in each at different times. One of them had been seiz'd with a piercing pain about the middle of the right side, from external cold, that seem'd to be mov'd, and carried about, in the space it occupied, which was but very small: warm cloths being applied to the part, the pain did not remit, but increas'd by the touch, so that the patient could not lie down on that side. In the night a fever came on, which began with cold, and went off with a sweat. And although this fever was intermitting, yet, as it return'd every night, and the pain continu'd just the same, the young man came into the hospital; where blood being taken from his arm, and his side being anointed well with warm linseed oil, the pain chang'd its situation indeed, and its nature so far, that it troubl'd him, rather, by being heavy, and oppressive, than by piercing as before; however, the ensiform cartilage, for to that part it had shifted

(*f*) Dissert. de Vena sine pari.(*g*) Tom. 1. inter Medica.

its situation, could not endure the touch, when applied to it. This being the state of things, now that it was the ninth day from the beginning of the pain, a cough suddenly came on, by means of which the patient threw up a fetid coagulum of blood, equal in bigness to a pretty large chestnut. And this being discharg'd, all the symptoms I have mention'd vanish'd; so that the fever did not return on the following night, but rather sweats, and soon after, not even these.

I enquir'd, therefore, from whence came this coagulum? for it was of such a magnitude, that it did not seem to have come from the aspera arteria: and that it came from the internal nostrils, notwithstanding blood had proceeded, not long before, from the external, the patient constantly denied; and I was dispos'd to give credit to him, not only by what had preceded, but by the sudden solution of the symptoms, and by other corroborating circumstances besides. It remain'd, therefore, that it proceeded from the stomach; although no uneasiness had discover'd itself about the region of this viscus, particularly on the first days of the disease; nor any nausea, nor any propensity to vomit, had preceded the discharge of that coagulum.

And there is no doubt, but what had happen'd in the other young man had a reference to the stomach. For he being affected with a pain of the side, cough, and other marks of the pleurisy, and complaining only of these, except that he was, nevertheless, attack'd, at the same time, with a nausea, and being made worse by such remedies as are generally of advantage in pleuritic patients, at length, threw up, by vomiting, a round worm, together with blood, and was immediately freed from all those symptoms which I have related.

Nor yet did I mention this observation on that day, because I consider'd it as a very rare one: for it did not escape me, how many of the same kind had been publish'd, since the time that one had been propos'd by Gabucinus^(b), which seem'd so wonderful to Donatus⁽ⁱ⁾; and that not only by those whom Etmuller speaks of^(k), but also by others, who are mention'd in the Sepulchretum^(l). To which there are still others that may be added, as you are not ignorant, and in particular from Harderus^(m), Raygerus⁽ⁿ⁾, and other very famous men; as especially from John Baptist Verna^(o), and Joseph Anthony Pujati^(p), formerly my auditor, and now my very deserving colleague, by whom alone many observations of this kind are, according to his custom, learnedly and accurately propos'd. But I mention'd it for this reason, because a discourse was made that day, in the Academy, upon the pleurisy, on account of some letters that were sent to me by a late very experienc'd physician of Cremona, Ignatius Pedratti by name, in which he describ'd, with great exactness, the pleurisies from worms, which went about in the winter of the year 1705, at Farnese, and in the neighbourhood, where he practis'd physic at that time. Therefore, in order to shew, first, that the similitude of a pleu-

(b) Comment de Lumbric. c. 13.

(i) De Medic. Hist. Mirab. l. 4. c. 6.

(k) Prax. l. 1. S. 18. art. 9.

(l) Schol. ad Obs. 38, hujus Sect.

(m) Apiar. Obs. 96.

(n) Vid. Act. Lipf. A. 1691. M. Janu. in fin. ad Obs. 26.

(o) Princ. morb. acut. Pleurit. P. 3. c. 11. n. 19. & seqq.

(p) Dec. rar. Medic. Obs. 7.

riſy is ſometimes brought on by worms, which would immediately vaniſh upon the worms being thrown up; and, ſecondly, that the true pleuropneumony might ſometimes happen, if theſe creatures continu'd to irritate, and by this means, not I know not what vapours, but conſtant ſpaſmodic ſtrictures of the membrane, being communicated, which at length would detain the blood, eſpecially if viſcid, in the narrow parts of the ſmaller veſſels; I thought proper to confirm the former by my recent obſervation, as the latter might be argu'd from the recent obſervations of Pedratti.

44. But becauſe I find no diſſection in the Sepulchretum, which ſhews, that, in a pleuriſy from worms, the interior parts of the thorax can really be inflam'd, as thoſe which are produc'd from Quercetanus (*q*) only exhibit heaps of worms, that were found in the ſtomach and inteſtines; I will add what Pedratti then obſerv'd in the thorax [of thoſe who died of it, after having firſt, however, ſignified, in a ſummary manner, what ſymptoms he obſerv'd in the living patients, not only from that which he had then written, but alſo from what he added before us, as he had made many obſervations after writing his epiſtle. For it is of advantage to have read and compar'd one with another the many conſtitutions of deceitful diſeaſes, which have been obſerv'd at different times, and in different places. Firſt of all, there was a pain in the ſide, that was rather obtuſe than pungent, which, beſides that it ſometimes had intermiſſions, was in the beginning tolerable. But, in the mean while, ſymptoms appear'd of worms harb'ring themſelves in the belly: and, indeed, ſome of theſe creatures were, for the moſt part, ſeen to be thrown out from the mouth, or with the ſtools. At the ſame time there were white unconcocted ſpittings, not without a very violent cough, and theſe already tinctur'd with a kind of bloody filaments. The fever, which had begun with a ſhivering, continu'd on, with almoſt the ſame courſe and tenor. The pulſe was not, as it generally is in a pleuriſy, hard or tenſe, but low, ſmall, and unequal. From the beginning quite to the fifth day, or after that, to the ſeventh, the diſorder not only ſeem'd not to increaſe, but rather to decreaſe, and even to be now almoſt quite ſubdu'd, the pain and the cough going off, and the fever itſelf being much diminish'd. But afterwards, all theſe ſymptoms were made ſo much more conſiderable than before, and ſo great a difficulty of breathing, and dejection of ſpirits, were join'd to them, that within forty hours, the patients, being miſerably reſtleſs, internally hot, but in the whole external part of the body extremely cold, and, what was a very certain ſign of death, livid like a carcaſe, died, no remedies being then of any effect. But in the beginning of the diſeaſe, as it was afterwards obſerv'd, it was of ſervice to thoſe who had a ſtrong conſtitution, to give ſuch things as excited vomitings, and, in particular, that which they call'd the aqua Rulandi; in regard to which I would have you conſider, what was the opinion of Quercetanus in pleuriſies of that kind; for you have it in the Sepulchretum (*r*). But it was not of ſo much ſervice, in this diſeaſe, to open the belly, even by freſh-drawn oil of almonds, or ſweet mercury, as it is call'd, join'd with a little myrrh and corraline, in order more cer-

(*q*) Obſ. 38, paulo ante cit. & Schol. ad cand. in ſin.

(*r*) In cod. Schol.

tainly to drive away the worms. For although they were surpris'gly expell'd by this medicine, yet the pain was soon after exacerbated by the stools, and the inflammation increas'd. And the oil, though it seem'd at first to render the expectoration more easy, yet soon after, as if it had relax'd the lungs, the difficulty of breathing being increas'd, it accelerated death; so that it was necessary to disuse this remedy entirely.

And it was necessary to abstain from blood-letting, as it lessen'd the strength; so that it was scarcely ever made use of, only when the inflammation ran high, and then but in small quantity at a time, and cautiously. Whether, therefore, this disease is to be so explain'd, as was a little while ago hinted (*s*), the explanation being confirm'd by the advantage from the aqua Rulandi throwing out immediately, and in the beginning of the disease, that which would have made the blood more viscid; or even whether this water being consider'd to act like an antidote, as it was by Quercetanus, and others, you chuse rather to suppose that the disorder had something pestiferous in it, which the worms rather accompanied, than brought on; for even p. silitential pleurifies are sometimes observ'd, to which species those that you read of in Ballonius (*t*), in the first annotation, are referr'd, and that are describ'd by him in the beginning of the vernal constitution of the year 1571, though but slightly taken notice of in the Sepulchretum (*u*); this, however, is certain, that many bodies which had died of the disease before describ'd, being dissected, both at Farnese, and in the neighb'ring villages, the viscera of the belly, indeed, appear'd to be differently affected in different bodies, just as the particular constitution, and the disorders proper to each, had inclin'd them to; that is to say, some were schirrhous, obstructed, or in other ways diseas'd, and that the stomach was very much affected above all the others, inflated after the manner of a tympany, and loaded with a putrid and strong-smelling saburra of humours; but that the principal injury in all, within the penetralia of the thorax, was found to be nearly the same with that, which, for this reason, is added below from one only.

45. The lungs of a man, who had been taken off, in a violent and speedy manner, by the disorder just now mention'd, were swell'd to such a degree, as to fill the whole cavity of the thorax. And the left lobe, in which side the pain had been, seem'd to be quite inflam'd, and blackish, and was, besides this, towards the lower part, stuff'd up with a white ichor, like an abscess. The pleura was every where inflam'd and livid, and distinguish'd, as it were, with some bloody points. The intercostal muscles, and particularly the internal on the left side, had contracted so considerable an inflammation, that they appear'd to be black, like a bruised part. At length, in the ventricles of the heart, and the large vessels of both kinds that are annex'd to it, were coagula of black blood, which were not much unlike populous concretions.

46. From these circumstances which I have related, of the pleurisy from worms, join'd, however, with those which the authors above commended (*x*)

(*s*) N. 43. in fin.

(*t*) Epidem. l. 1.

(*u*) Schol. ad Obs. 28 hujus 4 Sect.

(*x*) N. 43, & seq.

have written on the same subject, it will already appear very clearly to you, that there are no true signs of a pleurisy, which have not been sometimes also observ'd in this; and not only when it had already degenerated into a true pleurisy, but even at the time when it only bore the similitude of it. For which reason, physicians ought to take care, especially in children, and in like manner in others, who are wont to be subject to worms, and in those constitutions also that are productive of them, lest they take any disorder for a true pleurisy, in which there is nothing but this similitude of it, and which will yield only to anthelmintics.

But in regard to the inflammation of the diaphragm, mediastinum, and pericardium, as whatever of this kind I have seen has been slight, and join'd with the inflammation of the lungs, it is hinted at in conjunction therewith, already, in this letter (*y*), and even in another (*z*). You may therefore see, who have not only met with particular inflammations of these membranes, but have also remark'd their signs: for neither is sufficient alone. Thus, formerly, Avenzoar (from whom a pretty long passage is produc'd by Zacutus(*a*), and consider'd much at large before Freind(*b*)) had propos'd signs of the inflammation of the mediastinum, which he made no scruple to believe he himself had suffer'd. So likewise Jacotius(*c*) related the marks which he believ'd to agree with the same disorder, also, from the opinion of Avicenna. So, finally, you will read, by what symptoms Heurnius the elder(*d*) conjectur'd, that a certain young man had died from this cause. On the other hand, Nicolaus Massa(*e*), who says that he has even seen apostems in the mediastinum, added nothing in regard to their signs, notwithstanding he had diligently related those which had accompanied a pleuritic apostem, in a noble Florentine; which disease, and dissection, I do not see that any mention is made of in the Sepulchretum. And although he says, "that he had "seen many who died from a pleuritic apostem, in whom the abscesses were "large;" yet I have not taken notice of these above, as I was uncertain whether large apostems of that kind related to those I was then treating of, or rather, as in that Florentine, of whom he spoke, to such cold humours as occupied even the neighb'ring muscles, had been of long standing, and very troublesome, by creating a heavy pain, and a constant little cough, for many years.

There is a necessity, therefore, of having marks confirm'd by dissections, in order to make a proper diagnosis of the disease, and cure it by a proper and speedy administration of remedies; or if this be not in our power to perform, at least, that we may be able to admonish the friends of the patient of the great danger of the disease, and, that we may not seem to be deceiv'd, foretel what appearances will be found in the body, after death. And both of these things, which I say are equally requir'd, that very excellent physician my neighbour Salius, will shew(*f*). For he, when he was a very young man, having seen, for the first time, an inflammatory

(*y*) N. 35, 36.

(*z*) Epist. 7. n. 11.

(*a*) De Medic. Princ. Hist. l. 2. hist. 23.

(*b*) Hist. Medic. ad A. 980.

(*c*) Comment in Coac. Sect. 2. l. 5. aph. 65.

(*d*) Enarrat. Hippocr. l. 5. aphor. 24.

(*e*) L. Introduct. Anat. c. 27.

(*f*) De Affect. Particular. c. 6.

tumour in the mediastinum, of a considerable size, and having accurately observ'd what symptoms had existed in the patient; never ceas'd afterwards diligently to compare them with those of a similar kind, which occur'd in other patients; for which reason, he not only determin'd what were the symptoms of the disease, but also publish'd an entire treatise, written learnedly, and skilfully, on that head, which is the first that physicians ever have had. The observation which gave rise to that treatise, you have in this fourth section of the Sepulchretum (*g*): and in the first section of this second book, you will read another (*h*), which was publish'd in the age following, by Panarolus, which is taken no notice of by those whose writings I have seen upon this disorder: in regard to which, I heartily wish the other symptoms, that I suppose were not wanting, had been also specified; and that the fear of the inflammation, which perhaps touch'd, in some measure, upon the pericardium, had been clearly pointed out. The second of these circumstances you will find is not wanting, in the observation of Heurnius the younger, which is, in like manner, transferr'd into the Sepulchretum (*i*); but you will find no remark made what symptoms were peculiar to this inflammation, before it pass'd into vomicae, or even after it had undergone that change.

So that I shall point out to you all the examples of inflammation and abscess of the mediastinum, in the Sepulchretum, and in like manner, of the pericardium, that you may be able to read them over the sooner. First then, you will see the same observation, which I said was that of Salius, as it describes an inflammatory tumour, belonging in part also to the pericardium; for which reason Salius has treated of the inflammation of both these membranes, at least before he could have seen the observation of Rondeletius (*k*), as it was publish'd at Lyons, in the year 1583, being the very same year in which Salius, on the 15th of March, wrote his preface at Faenza, to be prefix'd to his work. And as to the histories that were written in the next age, which you will see quoted from Hildanus, and in like manner from Zacutus, know that two are quoted from each of them, in order to prevent your being deceiv'd. For you will find the first of Hildanus in the Sepulchretum (*l*), not far from that of Rondeletius, which was just now mention'd, and the other in this fourth section (*m*). And there that which is proper to Zacutus (*n*), is also to be found, but must not be look'd for in the second book of his work, which you will see there refer'd to by the printer; but if you should wish to compare them together, and indeed it is not related exactly in the same manner by the author, you must turn to his first book. But the second of Zacutus, certainly, has no relation to the pericardium, and is even Avenzoar's description of his own disease. And as, according to Freind's admonition (*o*), inflammation and abscess of the pericardium also, as well as of the mediastinum, are taken notice of by him, how shall we excuse Salius and Rondeletius, for making no mention of it?

(*g*) Obf. 2.(*h*) Obf. 125.(*i*) Sect. 4. Obf. 27.(*k*) Sect. 8. l. hujus 2. Obf. 4. § 12.(*l*) Obf. ead. § 5.(*m*) Obf. 4.(*n*) Obf. 29.(*o*) Hist. & A. cit.

especially as the latter has written, "that this disorder had, as far as he knew, been observ'd by nobody;" and Salius, "that it is surprizing, by what means those who teach the practice of physic, have so far neglected both the disorders, as not to mention the least word of them:" although he has here sufficiently declar'd in his preface, whom he meant, that is, "the most modern physicians," and has shown also, in his preface, why, as Jacotius has judg'd, not while he was teaching the method of cure in all diseases, as practical professor in ordinary, but while he was interpreting the *Coacæ Prænotiones*, he himself could not attribute the knowledge of the inflammation of the mediastinum to Avicenna, though he would have so much the more readily ascrib'd it to Avenzoar, because, by this means, he would have confirm'd the greater part of his signs, by the authority of an ancient physician, as the custom then was. And as to what I would have said for Rondeletius also, so great was the fame of Avicenna, before the other physicians of the Arabian school, that what was not extant in his large work, it seem'd to be in vain to look for in any other of his writings. But it is far from being so easy to excuse Ludovicus Mercatus, whose writings upon these disorders (p), if you compare them with the treatise of Salius, whom he does not so much as mention by name, you will immediately perceive, were all taken from Salius. But in proportion as some who liv'd in the same age, were less grateful to Salius, as frequently happens, so much the more grateful, and more just, has been an eminent writer in this our age, Freind (q); and in like manner the two very eminent Archiaters, whom I very lately read, in that part where they treated of these disorders, at the time I was revising this letter: one of them has even expressly confirm'd the observation of Salius, by his own; and the other has shown how, and when, by the inspiration of very cold air, or by drinking of very cold water, the mediastinum, inasmuch as it is intercepted by the lungs, and intercepts the œsophagus, may be, without great difficulty, inflam'd. Yet I should not believe that he, in other respects a learned man, was ungrateful to Salius, who, although he publish'd his work in the tenth year after the History of Physic, by Freind, had come out, yet complain'd, that the inflammation of the mediastinum had been pass'd over by all, unto that time, some signs of which he produc'd in the mean while, that are to be met with among those before propos'd by Salius: for he has not so much as omitted the syncope, where the inflammation touch'd upon the pericardium. That complaint, therefore, I should rather think arose from this cause, that all of us can neither read all things, nor yet remember all that we do read.

However, in reading over again the signs observ'd by Salius, you will perhaps wonder at this, that, as he remark'd the uneasiness at the sternum, he did not also remark that uneasiness at the vertebræ of the back; or when he gave as a reason for the former, the circumstance of the mediastinum being tied to the sternum, that he did not attend to the circumstance of its being tied to the vertebræ also: or at least, that he did not admonish (which was perhaps the case) that those inflammations had been seated nearer to the sternum than to the vertebræ; which distinction, in some passages of Hip-

(p) De Intern. Morb. Curat. 1. 2. c. 6.

(q) loco modo indicato.

pocrates, "of the pleurify at the back," that are differently explain'd in the Sepulchretum (*r*), is touch'd upon by the celebrated Verna (*s*): although, in the preceding letter (*t*), another reason is also pointed out by me, why, when the mediastinum is affected, it may sometimes happen, that the sternum, rather than the vertebræ, shall sympathize with it.

But now mention is made of the vertebræ, I cannot help wond'ring, that since the pains of the head are so often accounted for from the impetus, or delay, of the blood in the meninges of the brain, or from some other injury, or irritation, of these membranes, why, in order to explain pains of the back, of which this section of the Sepulchretum expressly treats, the meninges that invest the spinal marrow, are so very seldom taken notice of, as they are, in effect, nothing more than those superior meninges produc'd into the cavity of the vertebræ.

In this very section, examples are also produc'd of pains in the thorax proceeding from an aneurism. Of which, notwithstanding I have written many things upon aneurisms, in a preceding letter, and am to write more hereafter in another, I will here produce two examples; the first for this reason, because I could scarcely find out any other mark of an aneurism, besides the pain within the thorax; and the second, because in that the pain of the thorax seems to be accountable for, not only from the aneurism, but also from the weight of the liver.

47. A woman, of a middle age, who had been in the hospital at Padua before, on account of a pain in the internal part of the thorax, on the left side, return'd into the same hospital, before the middle of January, in the year 1717, complaining of the same pain, which was now join'd with a violent fever. Her pulse was very tense, and chord-like: and the disorder seem'd to be extremely violent, but not so as to make us suppose death to be near at hand. Nevertheless it was; for the woman died suddenly, on the very day after she came into the hospital.

The thorax being open'd, there appear'd, at first sight, to be a kind of dropsy in this cavity. But as a great quantity of coagulated blood was found below the water, it was clearly understood, that the serum of this blood had resembl'd a species of dropsy. As we enquir'd whence this blood had proceeded, a great aneurism of the aorta discover'd itself, which was already ruptur'd. And examining this artery with some accuracy, I made the following observations. From the very beginning it was wider than is natural, and internally unequal. Nor had it dilated itself into an aneurism so very manifestly, before it had sent off the subclavian artery. From thence, not a lateral sac was form'd, but the trunk expanded itself, equally, on all sides, so as to form a large cavity, approaching in its figure to a spheroid: at the lower part of which, it again contracted itself into the bounds of an artery, and descended according to custom, upon the lower vertebræ of the thorax. But above, where I said it was dilated, I found that it press'd upon the higher part of the left lobe of the lungs, on one side; and that, on the other side, it urg'd some of the bodies of the vertebræ, and the lateral process,

(*r*) Sect. hac 4. Append. ad Obs. 39.

(*s*) P. 3. c. 8. n. 9. & 12. libri cit. supra, ad n. 43.

(*t*) n. 12.

and the nearest part of the ribs on the left side, in like manner. And all these bones were, in those places, extremely hollow'd out; and that part of the lungs was black, and so hard and compact, as to perform that wonderful office, which I just mention'd in the second of the *Adversaria* (u). For the internal surface of the aneurism not being cover'd over in this woman with any polypous concretions, shew'd the internal surface of the artery, in some parts of it, though very rare, and narrow, to be so lax, that scales, as it were, might be easily pull'd away from it; so also the internal and external substance, where the aneurism was closely conglutinated with the lungs, appear'd to be corroded, and quite destroy'd, for the space of two inches. This deficiency, however, of the arterial coat was wonderfully, but evidently, supplied by the lungs; so that no blood could pass out, either at the borders of that space, by reason of the very considerable, and very firm conglutination; or through the substance of the lungs, inasmuch as this viscus was very compact in that spot, and in the neighb'ring parts about: for which reasons, the woman had no bloody spittings; and I found the internal surface of the aspera arteria, and of the bronchia, to be entirely without any extravasations of blood. But there was no disorder in the heart, and no polypous concretion, except one, somewhat long and slender, which went, from the left ventricle, through the aorta, quite to its curvature: and, indeed, the blood in the heart, and in other parts, was found to be no less fluid than black.

The abdomen, which was not without rugæ, being open'd, besides that singular flexure, and situation of the large intestines, which I have sufficiently describ'd in the third of the *Adversaria* (x), and the discolour'd liver, the parts destin'd for generation exhibited some things worthy of notice. For both of the testes were black, the left being also hard, and in part full of half-concreted blood. Both of them were so connected to the tubes, and the neighb'ring parts, that you could not know for certain, to which, in particular, the hydatids that lay about them belong'd, which on the right side were small in their size; but on the left, was one very large hydatid, and others, adhering to the parietes of this tube, to so great a number, and of such a magnitude, that all of them together were suppos'd to contain water to the quantity of four ounces. This water was yellowish; and the coat of each hydatid was double, the internal of which being the thinner, was furnish'd with small vessels of a whitish colour, as they then appear'd.

Each of the tubes, amongst these hydatids, and from thence to their termination, was impervious; but near the uterus was become thicker, and not only pervious, but dilated: and in this part, the left tube was full of an almost limpid mucus. But in the internal part of the cervix uteri, which was here very long, was a very tenacious mucus of a yellow colour, degenerating into black. But the corona, or circle of the os uteri, which hangs out into the vagina, and the vagina itself, were smear'd over universally with a kind of whitish matter, as if the woman, which could not be certainly known, had labour'd under some kind of fluor, which had its origin no higher than

(u) *Animad.* 39. ad fin.(x) *Animad.* 14.

from this part, as is indicated by the mucus I have describ'd in the cervix, and in the tube, being so different in its colour from this.

I also wish'd to know, whether the woman had complain'd of her breasts, but in vain : for examining these internally and externally, and observing that they were here and there harder than they ought naturally to be, especially in those that are rugous and flabby, I press'd out a serum by squeezing them, which proceeded from little foramina of the nipples, in a turbid state, and of a dilute colour, but nearly approaching to that which I said was like tobacco; and from other foramina a serum issu'd, quite of a greenish colour, degenerating into black. And, indeed, from the glandular substance of the breast, when cut into, a green serum, in some places, burst forth, and in other places a black : yet, when this serum was wip'd away, the substance itself appear'd white, and sufficiently sound.

Last of all, as I had perceiv'd that there was water in the spine of the tube, by examining carefully, both internally and externally, those vertebræ of the thorax, which I have said were hollow'd out by the aneurism, it was very evident, that the injury of these vertebræ had not reach'd through to the cavity of the tube.

48. Of that green and black serum of the breasts, I shall say something on another occasion (y), not to digress from my present design. But if you should here be surpriz'd, that the aneurism, whose force had hollow'd out those bones, could not, in like manner, destroy the so much softer substance of the lungs, or, at least, tear asunder that conglutination which was about the borders of the opening, I would advise you to read the observation of the celebrated Maloet (z), in which, though an aneurism adher'd to the trunk of the aspera arteria, and the cartilages of this tube made up a part of the parietes of the aneurism, as the lungs did in ours, yet that impetus of the blood which had worn away those cartilages, and in part eroded them, had neither dissolv'd that cohesion which was round about, nor yet had corroded, or perforated, the other so much softer, and more slender parietes of the aneurism. For, without doubt, those parts which yield to the stroke are less injur'd, but those which most strongly resist receive the greatest detriment. So also, to use a more recent example among many, you will learn from the observation of Schreiberus (a), that, although a large aneurism of the aorta, under the muscles pectoralis major and minor, was ruptur'd in such a manner, that the foramen might admit a fist, and had consum'd three ribs in that part, it had, nevertheless, neither injur'd the lungs, which it had press'd back, nor the diaphragm, with which it had grown into one substance, nor in any way hurt the pectoral muscles, with which it was shut up externally. But now let us come to the last observation.

49. A young man, who was much giv'n to the custom of drinking great quantities of wine, and the more so, because his trade, which was that of a cook, excited his thirst, after great fatigues in this business, began, a month before he came into the hospital, to be very bad in his chest and sto-

(y) Epist. 50. n. 47.

(a) Nov. Comment. Acad. Sc. Imp. Petro-

(z) Mém. de l'Acad. R. des Sc. A. 1733. pol. Tom. 3. in Phisic. Obs. 4.

mach, and to breathe with difficulty: soon after, also, a kind of hardness came on about the navel. All these symptoms were without a fever. Having lost blood from his arm twice, but in moderate quantity, and taken such things as tend to soften and promote expectoration, he was so far better, that he seem'd to himself to be quite well. But eight days after, having acted imprudently, according to his own confession, in this one circumstance only, that he had walk'd too much, his legs being even then weak, all these symptoms return'd in a much more violent degree. I, at length, saw him, when he was brought into the hospital of St. Mary de Vita, at Bologna, on the last day of April, in the year 1703, either on the eighth or ninth day after the relapse. His face was whitish, and somewhat swell'd; his feet cold, and for three days past had become tumid, in the same manner as his legs. He made but little water, and had a very great thirst. He lay down with equal difficulty in every posture; but if he attempted to lift up his head, a sweat broke forth on his forehead. He complain'd of these things, and of those which I spoke of above; but most of a tightness of the chest, and especially of a very great weight, just as if, according to his own mode of expression, a loaf of bread lay upon his breast. Attempting to feel his pulse, I touch'd both his wrists to no purpose; for no pulse could be perceiv'd in either, notwithstanding the man, in regard to his head, was extremely well, and, as far as the difficulty of respiration suffer'd him, related all the circumstances that I have related with sufficient readiness; and added this, moreover, that he was now seiz'd every night with a fever, from which his body was hot, but only from the middle upwards. I was very desirous to know, whether the pulse, which lay latent in the day-time, might not discover itself at that time, at least; yet all the symptoms growing so much worse, that he died on the next day, it was not in my power to enquire into that, or any circumstance, otherwise than by the dissection of the body; out of the mouth of which a large quantity of blood had issu'd.

In the thorax and belly was some water, yet not in a very considerable quantity. But in the thorax was a heart, which was one of the largest I had ever seen; and that, as also the right auricle, which was very much dilated, and the coronary vessels, which were very large, were full of black blood, almost fluid, and without any polypous concretion. And the fibres of this heart were very lax, so that even those columnæ, which are prominent in the ventricles, easily follow'd the fingers of the person who pull'd them.

In the belly, that part of the small intestines which corresponded with the navel, seem'd to be inflam'd, as it were, to the extent of a hand's breadth. But the spleen, being closely annex'd to the diaphragm, was of a colour really preternatural. And the liver, in like manner. These two viscera were also hard; but the liver the most so, and for that reason very heavy: so that I did not doubt, but the weight of this viscus, being added to that of the heart, when enlarg'd, and fill'd with blood, had caus'd the diaphragm to be more oppress'd, and driv'n downwards; and that by the same diaphragm, the liver, and the other neighb'ring viscera, were urg'd downwards. But from whence, or by what means, the blood came into the mouth of the carcase, was not found out, as there was not time diligently to enquire.

50. But from the other appearances, which I have said were found in the dead body, it is easy to explain those symptoms that had troubl'd him when living. I will not, however, do this, lest, if I add any thing more, I should seem to have intended to send you a volume, rather than a letter. If you compare this observation with the others that I have written to you before (*b*), upon the prolapsus and aneurism of the heart, and the foregoing with those that I have written upon the aneurisms of the great artery (*c*), you will do what is very much to the present purpose, and will find join'd to each of them most of those explications which are purposely omitted here. Farewel.

LETTER the TWENTY-SECOND

Treats of the Hemoptoe, of purulent and ill-condition'd Expectoration, the Empyema, and Consumption.

1. **I**T is but just, at length, to make amends for the prolixity of one letter by the brevity of another. For which reason, this will not be long, notwithstanding it will comprehend the diseases upon which there are three sections in the Sepulchretum, and one of them very long. But lest you should suppose this to happen from a kind of carelessness, or too great haste, first, I will give you the reasons for the prolixity of others, and my own brevity.

2. It is true, you will find a great number of articles, and many of them very useful and curious, in those three sections of the Sepulchretum, that is the fifth, sixth, and seventh, whether you read the observations or the scholia. But, at the same time, you will find many things that you would be very willing to do without. And for instances of what I assert, take the following, in the fifth section (*a*): “the substance of the heart thrown up by spitting; (*b*) an hæmoptoe from the rupture of a vessel in the right side of the suspensorium of the liver; (*c*) the vena cava ruptur'd in the lungs;” and, in the seventh section (*d*), “a consumption arising from the kidneys, and especially the right, being grown, as it were, to the liver, by peculiar membranes, with which they were invested.” Some of the observations also are repeated, and among these the very first in one of these sections (*e*), as the scholia are also (*f*). But, to keep to one section only, pray compare the sixty-ninth observation with article the second, under observation the twenty-fourth; and article the first, under the hundred and thirty-

(*b*) Epist. 17. n. 28.

(*c*) Epist. ead. & 18.

(*a*) Obf. 21.

(*b*) In Schol. ad Obf. 24.

(*c*) In Additam. Obf. 1.

(*d*) Obf. 126.

(*e*) Sect. 6. Obf. 14.

(*f*) Ibid. secundum ad Obf. 9. & ad 31. in Sect. 7.

first observation, with article the second; and finally, the hundred and forty-fourth observation, with the hundred and fifty-fourth; and you will see that those things are produc'd six times over, which it would have been sufficient to have produc'd three times: and that they are repeated so as to confound the readers, who will suppose, that two books of Thomas Bartholin are quoted in the third observation, whereas one and the same is refer'd to; and in the second, the readers will be in doubt, whether it happen'd at Frankfort *ad Viadrum*, or rather at Frankfort *ad Oderam*, or on the Oder, where the observation was really made; and finally, in the first observation, when the readers shall observe, that in the dissection of the body of Christophorus Richter, the "uterus" is spoken of, by I know not what strange accident, how must they be astonish'd? I say nothing of the observation (g); "of a consumption from a gland growing to the pylorus," which is by no means an observation, but a conjecture, and that not a very well-founded one neither, if we attend to the similar appearances which I have seen in the same place, without any consumption attending them.

Nor do I say any thing of the scholium subjoin'd to the thirty-seventh observation, to which it can by no means belong, as there is nothing said about "a matron," or about "the cerebrum," in the observation (which mistake has also crept in elsewhere:)(b) nor is what Diemerbroeck formerly took notice of in regard to the action of the liver, spleen, and pancreas, of so much importance as to take up, with justice, a great number of pages in the scholium added to observation the hundred and fifty-fifth. But what shall we say of the additamenta to this same seventh section? I pass by many pages that are taken up with consultations (i). I pass by the observations, in which there is not so much as the name of the disorder that is the subject in question; I mean the consumption, as in the ninth. But certainly, the third observation, with a part of its scholium, had already been produc'd before, in this very section, and somewhat more at large, under observation the sixty-second, as observation the ninety-eighth and fifty-first, which are already given, are the same with observation the tenth and twenty-first, in the additamenta, if you except a few words that are added in the first of them, and many in the second; which Blancardus, according to his custom, has either omitted, or chang'd, as if it had not been the observation of Thomas Bartholin, but his own, of which circumstance Bonetus was more cautious, though not so much as might be wish'd, even in this very section.

If to all these things, and others of the like nature, which you yourself will probably observe, by enquiring more diligently, that great number of observations be added, which Bonetus, although he confesses they belong to other titles, does not, however, entirely pass by in this place, and other observations also, of which he does not confess the same thing, notwithstanding they equally belong to other places; and finally, that great number of those which, whatever was the cause of the wasting, we see thrown together into the seventh section, wherein, as the title of this second book, *De Affectibus Pectoris*, indicated, no other consumption ought to have had a place, but such as had its cause seated within the thorax; for we are not to judge

the same of a consumption, as of the injuries of respiration, which is always an evident affection of the thorax, wherever the cause of it may be seated: if, therefore, you attend to all these things which I have said, you will easily find from what cause it happen'd, that those observations, which are produc'd on account of the disorders propos'd in the Sepulchretum, have taken up so great a number of pages.

3. I, however, on the other hand, am so far from intending to relate any observations twice over to you, in this letter, or to throw together dissections which do not particularly refer to the thorax, that I shall not so much as mention a word of any, which, although they do relate to the present subject, I have had occasion of mentioning before, or shall have occasion of mentioning hereafter. And, indeed, there were some, perhaps, that related rather to consumption, than to peripneumony, which I chose to refer to the latter, in the two last letters, when I treated of that subject. For although sometimes there were expectorations, and a fever, of such a kind, that agreed better with a phthisis than a peripneumony, or the diseas'd appearance found in the lungs did not seem to be very recent; yet when Valsalva, who had inspected the patients, and the bodies after death, has expressly said, that they had died of a peripneumony; or when I was entirely ignorant of the inconveniences of the thorax, that had preceded, but knew what had happen'd latest of all; I rather refer'd these, in pursuance of his opinion, to the place where, without doubt, they belong'd in part, and whence you may, if you choose it, easily recal them. But besides these, I will give you another principal reason for my brevity at present. Valsalva, after having been in danger of a consumption, when a young man, as is written in his life, was rather cautious, I believe, of dissecting bodies that had been wasted away by disorders of that kind. And I, to open myself freely to you, confess, that when I was a young man I purposely avoided them, and do at present avoid them, though I am now an old man, not only for the sake of myself, but of the students who generally are about me; more cautious, perhaps, than you will think necessary for me to be, though you cannot deny but it is the safest method (k). For which reasons he did not dissect many, and I but one. The histories of these I will now recite in order; and first the histories of those which Valsalva dissected.

4. A man of fifty years of age, having suffer'd great fatigues in journeying, and at length returning home, complain'd very much of a pain in his chest, and a cough, by means of which he spat up a very little quantity of matter: he lay down most commodiously with his head bent forwards: his belly and feet were tumid: he thirsted much: he breath'd with a kind of panting motion: and was extremely oppress'd after food. To these symptoms a spitting of blood was added. But this was appear'd; the others, however, continu'd, except that for almost a whole month before his death, he was quite free from a pain of the breast. Yet, on the three or four last days, he was not able to lie down on the right side. At length, a great quantity of blood bursting forth from the lungs, he was suffocated.

The belly was universally fill'd with a yellowish water, not unlike the se-

(k) Vid. Epist. 49. n. 32.

rum which we see swimming round the blood, after it has been taken away from a vein, and coagulated. No lymphæducts were seen in any part. The spleen was equal in its bulk to the natural bulk of the liver, and was so closely connected with the neighbouring parts, that it could not be separated, but with difficulty. The liver seem'd to be in some measure contracted, and was pale both internally and externally; the coats of the gall bladder being very considerably thicken'd. But to the coats of the urinary bladder, cartilaginous concretions adher'd, here and there.

In the right cavity of the thorax the lungs were found, except that they were very red in the inferior part. But in the left cavity the whole lobe was pallid, contracted, and hard, and contain'd a sanious matter: besides, it was so connected with the surrounding parts, that it seem'd to form one body, as it were, with them, nor could it be separated without applying violence. The pericardium alio was every where connected with the heart. And the ventricles of the heart were quite empty.

5. You will ask, perhaps, how the left lobe of the lungs can be said to be contracted. and, at the same time, connected in so remarkable a manner with the surrounding parts? Without doubt, it was either not connected to all the parts about it, but only to some of them; or, if it was connected to all, it was not contracted in its circumference, but in its internal substance; for which reason it is said to be contracted, and hard, the sanious matter filling up the space, whatever was left within the contracted substance, the more easily, because the cough was but little able to discharge it from the lungs, that were thus contracted, and connected all round. And as the pain of the breast, and cough, indicate that these disorders of the lungs had not begun after the first spitting of blood; and as the absence of the same pain, for a month before death, indicates that the hardness of the lungs was greatly encreas'd before the second and more plentiful spitting of blood happen'd; it is probable, that this hardness much contributed to both of those bloody eruptions, which by streightning and compressing a part of the vessels, and, soon after that, by compressing them all, compell'd the blood, first, to break through some vessel in the same left lobe, and, last of all, to do the like in the right lobe. For that the blood, which was almost excluded from the left lobe, that was now universally hard and contracted, and for that reason pale, had made its impetus on this, not only the patient's incapacity of lying down on the right side, in those last days, but also the great redness of the right lobe of the lungs, towards the lower part, though in other respects found, seem jointly to demonstrate. And certainly, not only in consumptive persons, such as this man was, who had thrown out blood from the mouth, a hardness of the lungs was found, both by Wirfungus (l) and Ingrassia (m), but also by others, in whom there had never been purulent, but always bloody, spitings, as by Willis (n), whose explication I have in general follow'd here; yet shall be ready to follow any other at another time, if it should appear to me to be more proper.

But whichever you chuse to follow, in that spitting of blood, for which,

(l) Sepulchr. l. 2. S. 7. Obs. 6.

(m) Ibid. Obs. 102.

(n) L. 1. Sepulchr. S. 21. Obs. 7.

a young priest of the order of St. Dominic consulted me, it will not be easy to give a reason, why it should happen to those persons of whom he related the history. For when I ask'd him, whether his father, or mother, or the relations or ancestors of either, had labour'd under a spitting of this kind, he expressly denied it; but immediately added this, that his father was an Armenian, and his mother an Italian; and that it had been observ'd at Venice, in three other families, that the children whom an Italian mother had brought forth by an Armenian father, were liable to a disorder of this kind, to which their parents and ancestors had not been liable; and that three or four of his brothers had died of this disorder already. And this spitting of blood seem'd to him, and to me, to be scorbutic. But let us go on to the observations of persons labouring under an empyema.

6. A young man, of about eighteen years of age, seeming to have got rid of an inflammation of the right lobe of the lungs, by a proper application of remedies, was again seiz'd with a fresh fever, together with a cough, a purulent spitting, and thirst. In the mean while, his face swell'd. He lay continually on his right side, nor could he bear to lie in any other posture, even for a very short time. His belly became tumid. At length, after he had been troubl'd two months, and longer, with these symptoms, he died.

The abdomen, which in the dead body seem'd to have lost its swelling, being open'd, a large quantity of limpid serum came forth: yet no mark of injury appear'd in the viscera of that cavity. When the thorax was open'd, the right cavity thereof was found to be entirely full of pus, and the lobe of the lungs on that side so contracted, that it seem'd as if it had been originally deficient. And because, while the carcase was previously mov'd, pus had burst forth through the aspera arteria, enquiry was made whether it might not, possibly, have come from the cavity of the thorax, through the pores of the coat of the lungs, or by means of an ulcer, with which this coat was eroded, into the bronchia. But no ulcer could be perceiv'd in this membrane, or, at least, as far as it was in our power, by reason of the intolerable stench, to enquire. Nor was any large ulcer perceiv'd, when the contracted substance of the lungs was cut into, but only, in some places, very small tubercles, which discharg'd a little quantity of pus. The pleura, however, was found: but the pericardium full of water.

7. It were much to be wish'd, that the constitution of the membrane of the lungs could be search'd into by a longer and more accurate examination, that we might be at liberty to determine something in regard to the passage of pus, not so much from the cavity of the thorax into the lungs, as from the lungs into the cavity of the thorax. For as the pleura was found, it remain'd, that this quantity of pus had fall'n into that cavity from the lungs. In which, although no large ulcer was found, but only small tubercles, from whence we may suppose that the pus, which had flow'd out of the mouth of the carcase, had proceeded, and been collected, by degrees, in the bronchia; yet the contracted substance of the lungs might not only greatly diminish the cavity of the abscess, which had been in it before, but even entirely conceal it. Nor yet was the substance of the lungs, in this young man also, contracted in such a manner as it was in the man of whom we spoke just now (c).

I mean, so that the circumference was not at all diminish'd; but had been so far wasted in this case, that, at first, the lungs seem'd to be deficient. And the cause of this very great wasting might be double; in the first place, the great consumption of the internal substance of the lungs by suppuration; and, secondly, the compression upon the surface of the lungs, from the great quantity of pus which was effus'd into the thorax, so as to fill the cavity of it entirely. And how great is the force of either of those causes, may be conceiv'd from these very sections of the Sepulchretum. For you will read in them many different observations of different persons (*p*), from which it appears, that not only a great part of one lobe of the lungs, but the whole substance of it, was entirely consum'd by suppuration. And other observations are not wanting to add to them. For the illustrious Senac (*q*) has sometimes seen a whole lobe of the lungs entirely consum'd, and reduc'd into pus; and Laubius (*r*) the lungs on the right side more than half consum'd, and surrounded with an almost incredible quantity of pus: and the observation, also, of that most humane old man Dominic Passeri, an eminent physician at Pessaro, which was written to me in the same year that it was publish'd, that is, in 1734, seems referable to this class; and also the observation of Marcus Gerbezius (*s*), who found the whole right lobe of the lungs, together with the aspera arteria, to be fall'n down into a pultice-like consistence, by reason of putrefaction. And although Jo. Tackius (*t*) saw the lungs so thoroughly corrupted, that he affirm'd the right side to be quite devoid of lungs; yet Ritterus the younger (*u*) would excite our admiration more, by asserting, that in the left side of the thorax, which was half-full of a white purulent matter, the mouths of the vessels in that lobe, which was almost entirely consum'd, were open; if the very celebrated anatomist Haller (*x*) did not confirm it, by saying, that he had found, instead of the left lobe of the lungs, which had totally disappear'd, a great quantity of almost foetid water, viscid like the white of an egg, and in that the aspera arteria, and the larger arterial and venous vessels, in a manner cut off, and gaping so evidently at their termination, that it would be difficult to find out what put a stop to the flux of the blood. For Platerus, who had found, more than once, in consumptive persons, that no part of the lungs, on one side, was remaining, at least saw "the vessels of the heart, which went thither, and the branches of the arteries, stopp'd up," as you will read in this seventh section of the Sepulchretum (*y*).

And when you have well consider'd all these things, in relation to the former of those two causes of the decrease of the lungs, which I have mention'd; I would then have you, in regard to the other, turn to the first part of that scholium, which is subjoin'd to the fourth observation of the sixth section, in order to observe, that not only the lungs themselves are melted down by suppuration, and pour'd out into the thorax, but that even a far

(*p*) S 6. Obs. 4. 11. & in Additam. Obs. 1. § 2. & Obs. 4. & S. 7. Obs. 20. & 35. 103. & cet.

(*q*) Traité du Cœur, l. 4. ch. 3. n. 2.

(*r*) Aët. N. C. Tom. 2. Obs. 107.

(*s*) Eorund. Eph. Dec. 3. A. 3. Obs. 6.

(*t*) Dec. ead. A. 8. Obs. 155.

(*u*) Eorund. Aët. Tom. 6. Obs. 14.

(*x*) Opusc. Pathol. Obs. 17.

(*y*) Obs. 55.

greater quantity of pus is form'd from the fluids, which are carried, by means of the vessels, into that lobe. It must therefore of course happen, that this cavity of the thorax being fill'd, the lungs must decrease so much the more, as the pus is still more encreasing, and urges, still more, the remaining substance of the lungs, which was easily to be compress'd into a narrow compass, as well because the membranous vesicles, of which it consists, render it soft, as because the cavities that are made internally from sup-puration, make it still more liable to yield to the external force.

And indeed, from these, or some other causes of the like kind, do I think it has happen'd, that the lungs, being sometimes surrounded with a large quantity of water, have been so compress'd, that they seem'd almost to be deficient. Thus Columbus (z) says, "I have found, that a part of " the thorax was destitute of lungs, that is to say, that a very small portion " only could be found: and what remain'd of the cavity was occupied by " an aqueous humour." So also, at another time, Valsalva, whose observation will be produc'd hereafter (a), believ'd, at first sight, that there were no lungs, so contract'd were they under a great quantity of fluid! Thus, not to be too tedious, the deservedly commended Haller (b) saw the lungs, "in " a dropsy of the thorax, so compress'd, and grown to the pleura, that it " would seem, to an incautious observer, that there were none at all, as they " were at most scarcely more than three lines in thickness." And that a deception of the same kind had happen'd in the observation (c) which is exhibited in the fifty-sixth disputation, among the practical ones collected by him, seems very probable to this illustrious author (d). He nevertheless commends the histories which are inserted here and there in this dissertation, and relate to the vomicae of the lungs, and of the neighbouring glands. I would have you read them over. For you will find, as far as I could see, no small number to be added to the Sepulchretum; none of which it was in my power to take notice of in this letter, as the dissertation came so late to my hands, that the letter being not only revis'd, but also copied fair, I could but just insert these few things, which I at present say. But let us go on to the other observations of Valsalva, in which the bulk of the lungs was diminish'd.

8. A man, almost five and forty years of age, who had liv'd in a swampy and fenny country, began to complain of inconveniences in his chest; and among others of respiration being oppress'd, and especially after motion. After some months, he was seiz'd with a violent fever, together with an heavy and pungent pain of the left side, so as not to lie down upon it but with difficulty, a great thirst, a troublesome cough, a spitting of matter, at times, of a reddish colour, and a hard and quick pulse. These symptoms growing milder, after he had been in the hospital about a month, he went home again, with his thirst still remaining, a slight pain, and a plentiful spitting of serous matter. About twelve days after, a more ardent fever came on, being attended with a great thirst, a sense of weight in the whole

(z) De Re Anat. l. 15.

(a) Epist. 50. n. 4.

(b) Ad Boerh. Praelect. § 102. not. 17.

(c) § 65.

(d) in Tabula Disputation. Volum. 2.

chest, and a troublesome cough. The hypochondria were oppress'd, as if they had been bound round with a roller. At length he died.

In the belly nothing preternatural was observ'd, except that the spleen was extremely soft. In the left cavity of the thorax, the anterior surface of the lungs adher'd to the pleura; but the remaining surface of that lobe, where it approach'd to the back, being disjoin'd from the pleura, comprehended betwixt this membrane and its own, which was much thicken'd, a kind of sinuous cavity, full of serous matter, wherein swam many small pieces of membranes, resembling jelly; some of which kind were firmly connected, in a few places, to the membrane of the lungs. This lobe was internally sprinkl'd over with black spots, and so small in its bulk, that it scarcely equal'd a fourth part of its natural size. On the other hand, the right lobe sufficiently compensated, by its encreas'd magnitude, for the smallness of the other. The blood, except some small coagula of it, that were found in the right ventricle of the heart, preserv'd almost the same fluidity that it generally has in the living body.

9. Although Valsalva does not seem to describe any other serum in the left cavity of the thorax, in this dissection, than what he frequently has done, after a pleuripneumony; yet it must have been sanious, for this reason, because he prefix'd the title of empyema, to this disorder. And indeed it did succeed to an inflammation of the lungs, to which a perfect crisis had not been form'd: and what that lobe had suffer'd besides this, the great diminution of its bulk, not very obscurely, indicates. But in regard to the black spots, with which they were internally distinguish'd, if you here follow the opinion of Olaus Borrichius, in the hundred and sixteenth observation of section the seventh (*e*), they were "proofs either of a present corruption, " or of one speedily to ensue;" for he says, "that he had often observ'd them " in the lungs of such dead bodies as had been troubl'd with a catarrh, " while living:" although, as Valsalva has so often taken notice of these spots, in the histories describ'd in the twentieth letter, and elsewhere, you may easily judge whether it be probable, that all these, or the greatest part of these persons, had been troubl'd with a catarrh, as Olaus Borrichius, in that observation, if you read it over, seems to conjecture.

10. A man, of about thirty years of age, whose habitation was among fens and marshy places, having become subject to an inflammation of the thorax, after a lues venerea, had lain ill a long time in the hospital at Ferrara, in which he got quite rid of his ardent fever, but not entirely of the tightness at his chest. By degrees this last-mention'd symptom became even more troublesome. And indeed his legs, belly, and in short his head itself, began to swell, together with a slight fever, a thirst, a greater difficulty of breathing, a pain of the left side, on which he lay with the most ease, a frequent cough, and a continual expectoration of serous matter. In the meanwhile, the oedematous swelling of the head had so encreas'd, that not a little ichor flow'd out of the left ear; till at length, his pulse growing languid, so that for the two last days it could scarcely be perceiv'd, death put an end to the disease.

(*e*) 1. 2. Sepulchr.

While a passage was made by the knife to the internal parts, serum distill'd from the integuments, and flesh of the body. In the belly, also, was found a pellucid serum, but of a yellowish colour, which being put upon the fire, was almost entirely dissipated; that is, a pellicle, and some small striæ excepted. The intestines were, universally, of a pale colour, and turgid with air. But the liver was black.

The thorax being open'd, while the vena mediastina was, by accident, cut into, the blood rush'd forth with an impetus almost equal to that of the living body, when a vein is open'd: but the blood, in the whole of this body, was extremely fluid, and in a manner dissolv'd, no polypous concretion appearing any-where, not even in the heart itself. The right lobe of the lungs was connected, at the upper part, by slender membranes, to the ribs, and on the back part was inflam'd. But the upper part of the left lobe was hard, and seem'd to be, in a manner, fleshy, from inflammation; and the inferior part was divided into small pieces, swimming in sanies, which resembl'd a kind of gelatinous substance, and was found, in great quantity, in that left cavity. The pericardium, every-where, adher'd to the heart so closely, that it seem'd to make up one body with it. In some places it was cartilaginous, and in others it was become so thick, as to be equal to half an inch: but this thickness was owing to the filaments thereof being made thicker, and, as it were, fleshy, at the same time that a kind of oval bodies were intercepted betwixt them, which, when cut into, discharg'd a yellow serum, and when this was press'd out, represented a small kind of bladders, or follicles.

11. This was common to both of these men, that, as they liv'd in a moory country, they had the blood in a fluid state; and this second man still more than the other, so that he not only labour'd under an empyema, but a dropsy of the thorax: which disease, in the former man also, being in some measure join'd, perhaps, with the empyema, would afford a reason, why the humour found in the thorax might appear to be rather serous, than purulent. But in this second man, as the force of the dropsy was so much greater in the other parts of the body, may we not suppose it to have happen'd from this cause, that although a fresh inflammation of the lungs had been added to the other diseases, the fever, nevertheless, appear'd to be slight? or shall we suppose it to have been slight for this reason, because the pericardium, being more thick than the structure discover'd by Malpighi, and every-where adhering to the heart, resisted its greater agitation?

However, the lues venerea, which had first made this man liable to affections of the thorax, seems to have render'd the lungs more inclin'd to this very great corruption. At least, those who are exercis'd in anatomy and physic are not ignorant, that a consumption is frequently at length added to this disease. And you may see this from the dissection that I have describ'd to you in a former letter (*f*), in which the genitals were exceedingly diseas'd, and the lungs, at the same time, purulent. And also, when I dissected the head of a woman (*g*), who ran about through madness, and, for the same reason, was more expos'd to the lower and infected sort of people, I saw her

(*f*) Epist. 17. n. 25.

(*g*) Epist. 8. n. 9.

body wasted, and heard that her lungs were fill'd with a great quantity of pus. So I also heard, that the lungs of a strumpet, some other parts of whom I inspected in the latter end of the year 1716, were extremely injur'd. This woman had thrown up pus by expectoration, and had been long macerated with a slight fever, from a venereal cause; so that in the body after death "no traces remain'd of her breasts, but the nipples only were disscern'd," as Aretæus says in the description of a consumptive body (*b*). Thus you will see presently (*i*), what kind of lungs Valsalva found in another strumpet, after like marks of a consumption. For now, before we go on to the histories of consumptive patients, there remains another of an empyematic man, which I will immediately relate.

12. A certain man was thought to be free from a foregoing fever, but afterwards began to complain of a thirst, and a difficult respiration; so that he was oblig'd to draw his breath with his neck quite strait; and also of a sense of a certain weight in the middle of the thorax. He could by no means bear to lie down on the left side. And if his feet had swell'd besides, tho' they did not swell at all, in fact, it would not have been very absurd to have an idea of a dropsy of the thorax. But after death, the disorder was found to be an empyema, or pus filling the left cavity of the thorax. The upper lobule of the lungs, on the left side, had grown somewhat hard; and where it was turn'd towards the clavicle, had the vesicles of which it consists encreas'd to an amazing degree; so that some of them were equal to the bigness of a filbert, the other being much less. Some of them were of the figure of a globe, the rest of an oblong and oval one; all of them full of air, and externally furnish'd with sanguiferous vessels round about, inosculation of which appear'd in one or another. And one of them, moreover, shew'd some small foramina opening upon the internal surface.

13. It does not appear in this history, why the patient could not lie down on the affected side, which most of the others could, especially as no pain is taken notice of in that side, as was in the first (*k*) of those two men last describ'd. Nor is it very easy to conceive, in regard to that man with whose history we began, in this letter (*l*), to give the observations of Valsalva, why he lay more commodiously with his head stooping downwards, than with his neck strait, as, besides the causes which had their seat in the belly, others in the thorax were not wanting to excite a difficulty of respiration. But the explication of an observation of the celebrated Capperus (*m*), may seem much more difficult; I mean, that of a certain man who had putrid and corrupted lungs, and who, for the last five hours of his life, could at length lie on his back, after having been oblig'd to sit up in bed constantly, with his body so bent forwards, that he seem'd, as it were, to hide his head betwixt his knees. And this consumptive patient is one of the two, in whom riding on horseback, so much recommended by Sydenham (*n*), accelerated death: which circumstance gave occasion to the illustrious president Buchnerus, of adding a scholium, from whence you may judge, when that kind of exercise

(*b*) De Cauf. & Not. diuturn. Affect. l. 1.

c. 8. (*i*) N. 15.

(*k*) N. 8.

(*l*) N. 4.

(*m*) Aët. N. C. Tom. 4. Obf. 47.

(*n*) In Dissert. Epist. ad G. Coie.

is to be forbidden in a consumption, and when to be recommended with hope of success. Without doubt, as in other disorders, so in this also, the same remedies are not advantageous to all. For which reason, if any physician should enjoin to those who are subject to a consumption, to harangue in public, or to speak in any other manner vehemently and acutely, or to sing, because our Sanctorius (*e*) not only recommended these things, but also confirm'd their use by the example of an eminent orator in the church, who in his youth being liable to this disease, had afterwards acquir'd a very good state of health for himself, by making a public discourse every day with a loud voice; and yet this physician did not pay any attention to the state of lungs, which this orator, and the others to whom Sanctorius recommended it, were of, how many do you suppose he would rashly precipitate into that very evil from which he intended to withdraw them! When there was in Marcus Tullius, as he has said of himself, in the book which is entitl'd *Brutus*; I say, when there was in him "the greatest slenderness and weakness of body, with a long and thin neck, which habit and figure is suppos'd not to be very remote from death, if fatigue and exercise of the voice, together with considerable exertions of the body, were added;" and as he "spoke with all possible exertion both of voice and gesture, both friends and physicians advis'd him to leave off pleading causes:" for which reason he withdrew from the Forum, and did not return 'till after two years, when he was "almost transform'd. For having ceas'd from so great an exertion of his powers, and the business of oration having been quite at a stand, he had recover'd strength in his voice, and a tolerably good habit of body."

On the other hand, our Ramazzini (*p*) will shew, what frequently happens in the lungs of orators, readers, and singers, who do not use these exercises with moderation: and that the same viscus was entirely ulcerated, purulent, and altogether putrid, in a young man who play'd upon the pipe, and in a certain musician, the already commended Duiffingius (*q*), and Stegmannus (*r*), will teach you. And, indeed, I myself remember, that in a young man, a native of Forli, who had sung in the emperor's court with great applause, and with a very shrill voice, the organs of respiration were so ulcerated, that the disorder being now continu'd to the larynx and the fauces, he could swallow nothing, and even died suffocated, while he attempted to sup down gradually the yolk of a soft egg. But what Valsalva saw in the lungs of another person, who had been practis'd in the same art, and the use of wind-instruments of music, you will read presently (*s*). For previously to this, a few things are to be added, in relation to the history which I last of all propos'd (*t*); I mean, that it does not appear from whence the pus had proceeded, with which the thoracic cavity of the left side was fill'd, whether it was translat'd thither from any other part, or pour'd out from that upper part of the lobe of the lungs, which was something hard, and dilated into

(*e*) Comment. in Art. Med. Gal. *l.* 67. partic. 2.

(*p*) De Morb. Artific. *c.* 37.

(*q*) Commerc. Litter. A. 1741. Hebd. 44. n. 1.

(*r*) Eph. N. C. Dec. 3. A. 4. Obs. 109.

(*s*) N. 14.

(*t*) N. 13.

large vesicles. For if it were certain what symptoms the foregoing fevers had been attended with, or what other part of the body preserv'd any traces of injury, there might then be some room for our first conjecture. Now, notwithstanding those cavities of the lungs appear'd in such a manner, that they seem'd not unlikely to be taken for the vesicles thereof enlarg'd, yet that high situation in which they were, and the hardness join'd to it, may perhaps give rise to a suspicion that favours another conjecture, especially with those who do not believe it to be the effect of chance only, that it happen'd to Valsalva, in the dissections of consumptive persons, to find the same part of the lungs particularly injur'd, as the next observation will shew, and two others, that shall be produc'd afterwards, will confirm.

14. A certain man skill'd in the art of music, and the use of its instruments, being already of a middle age, had fall'n, three years before, into a spitting of blood, to which a cough, with a spitting of a catarrhus matter, as it is commonly call'd, succeeded. After many months being elaps'd, the hemoptoe return'd, and after this still at another time; 'till at length it left behind it an expectoration of matter, not only in great quantities, but thick, and of a very bad appearance. It is true, he could lie down easily on which side he pleas'd, and there was no pain in the thorax: but at night, and, in particular, after supper, the cough was troublesome. His respiration was also difficult, especially after motion, though never so slight. Add to these, a great thirst, and an oppression at his stomach after taking food. Some weeks before his death, he had frequent nocturnal sweats; and although his feet had been accusom'd to swell sometimes, and afterwards to fall quite to their natural size, in the last days of his life the swelling fell no more. And a diarrhea coming on, by which a great quantity of serous matter was discharg'd, and the patient beginning to put on his cloaths, in order to get up from bed, died suddenly.

The lungs of this man were fill'd with many tubercles. Moreover, the upper lobule of the lungs, on the left side, and in its upper part, towards the sternum, was externally very hard, and had within it an ulcer of a considerable size, in which was a quantity of sanies, almost of the consistence of a pultice. And here Valsalva observ'd, that in all the consumptive persons he had dissected to that time, the ulcer and disease was in the upper part of the lungs. As to what remains, near half a pint of serum was found in the right cavity of the thorax, and as much in the pericardium. This serum of the pericardium, being put upon the fire, evaporated wholly, except that it left a pellicle in the bottom of the vessel.

15. A strumpet, of about twenty years of age, had labour'd many months under a slow fever, a cough, an ill-condition'd expectoration, and a wasting of the whole body. She complain'd of a pain in the left part of the thorax, so that she could scarcely bear to lie down upon it. She was troubl'd with a difficulty of breathing. To which was added a copious spitting of blood: but this being check'd, and two days after a south wind blowing hard, in which state of air those who labour under a similar disorder, for the most part, perish, death put an end to her disease.

The right lobe of the lungs adher'd very little to the ribs. Both of them abounded with hard tubercles, which inclin'd to a white colour, and resembled

sembl'd glandular bodies. Besides, the upper lobules of the lungs, on both sides, had other disorders in that upper part. For the right lobe, towards the sternum, contain'd a large hollow ulcer, and in this a purulent matter; but the left, towards the side, contain'd a hard substance, equal to the bigness of a large pear, which, in some measure, resembl'd the substance of the pancreas, when indurated; and in the middle of this substance was a small ulcer, full of pus. In the pericardium was a small quantity of serum: in the left ventricle of the heart was a small polypous concretion; in the right was one of a moderate size, the greater production of which was inserted into the neighbouring auricle.

16. A virgin, of four-and-twenty years of age, was troubl'd with a cough after a spitting of blood: she expectorated a catarrhus matter, which at last resembl'd a fanies: she had a fever, and a pain in the thorax, but particularly on the left side, on which she could not lie down: she was wasted in her whole body, except in her feet, which were both somewhat swell'd; and the right was even attack'd with an erysipelas, some days before death.

The left cavity of the thorax was found to be fill'd with serum, small portions of coagulated blood adhering, here and there, both to the pleura, and to the lower edge of the lungs. The pleura was very red, just as if it had been inflam'd. And the lungs also had grown extremely hard, as inflam'd lungs are us'd to do. But the other cavity contain'd only a little serum, and had the pleura in a sound state. Nevertheless, the lungs of that side, where they were turn'd towards the clavicle, were a little hard, and in the center of this hardness conceal'd an ulcer. The pericardium scarcely shew'd any traces of its natural moisture. The ventricles of the heart were entirely full of concreted blood.

17. Not to mention the pleuripneumony, which seems, at length, to have degenerated into a consumption in this virgin, it was common both to her, and to the man (*u*) last spoken of, to have had not only tumid feet, but water in the thorax: whereas in the strumpet last mention'd (*x*), as the latter was absent, so the former was wanting also. And there is an old observation of Coiterus, commended here also in the Sepulchretum (*y*), of water being extravasated in the thorax of consumptive persons; although, as to what he says, that he had found it extravasated on the right side, which "is the most liable to these disorders," notwithstanding, according to his own inspections, it is no less truly said, than in the same page of the Sepulchretum (*z*), by Bontius, "that he had never seen the left lobe of the lungs alone connected to the ribs, but that he had either seen both connected thus, "or the right only." Yet these things have been seen by others in a different manner from what happen'd to them, and not very seldom neither. So also you will suppose it owing to accident, that it happen'd to Valsalva, in all the consumptive persons he dissected to that time (*a*), to find the principal injury of the lungs in the superior part (where it certainly was in the three bodies just now describ'd, as it was in another also, of whom the cele-

(*u*) n. 14.

(*z*) in Schol. ad Obs. 38.

(*x*) n. 15.

(*a*) n. 14.

(*y*) Sect. 7. Obs. 40.

brated Hoyerus (*b*) speaks) unless it be probable, that the greater distance from the septum transversum and the inferior ribs, and consequently from the most considerable agitation, is the reason why matter is more easily deposited in the upper part of the lungs, and more easily becomes inherent there, so as at length to ulcerate them. For tubercles, from which, according to the observations of Franciscus Sylvius (*c*), and others, a consumption frequently has its origin; tubercles, I say, as you will observe in the man and the strumpet, so in others also, are found in any part of the lungs promiscuously. And although Valsalva found them in the upper part of the lungs in a boy (*d*), whose sister and brother had been taken off by a consumption, yet in a certain virgin, whose history I shall immediately subjoin, he himself has declar'd, that there was no certain seat for tubercles in the lungs, nor yet in the young man of whom we spoke above (*e*); and in the woman, whose dissection is already describ'd (*f*), he saw the left lobe of the lungs containing small tubercles "here and there," some of which were suppurated.

18. A virgin was seiz'd with a fever, in consequence of a fright; and this fever was attended with a pain in her breast. The parotids, and almost all the glands of the neck were swell'd. She died.

The abdomen contain'd a little quantity of limpid water. The omentum was connected by a small kind of ligaments, with the mesentery and peritonæum. These three parts, and the surface of the intestines, uterus, gall-bladder, and bladder of urine, were unequal with protuberating bodies, lying at a distance from each other up and down, and of different figures and magnitudes, yet so dispos'd, that in the upper part of the omentum, they were very small, and in the lower part very large, and besides this very thickly sown, and contiguous to each other. In the left lobe of the lungs there was not only an ulcer which contain'd a sanious ichor, but beside this, such a kind of bodies as were found in the mesentery, and other parts of the belly. Some of them contain'd a pus, some a matter almost like a pulvise in its consistence, and others were still more solid, as if they resembled the nature of conglobated glands.

19. Morton rightly observes (*g*), "that it is not to be wonder'd at if scrophulous persons, who are frequently subject to glandular tumours in other parts of the body, are frequently affected with tubercles of the same kind, in the lungs themselves also;" and indeed, "that the most certain diagnostic" of a scrophulous consumption, "is to be taken from glandular tumours attending it, on the external surface of the body." And I follow'd this opinion and method of reasoning, confirm'd by the observation of the celebrated Laubius (*h*), and others, in a young nun, whose neck I saw to be unequal with glands, as it was in the virgin of Valsalva, when I ascrib'd the violent disorders of her thorax, such as attend a consumption, to the lungs being occupied with tumours not unlike those, espe-

(*b*) Act. N. C. Tom. 4. Obs. 118.

(*c*) Sepulchret. Sect. 7. cit. in Schol. ad Obs. 30.

(*d*) Epist. 1. n. 2.

(*e*) n. 6.

(*f*) Epist. 17. n. 5.

(*g*) Phthisiolog. l. 3. c. 1.

(*h*) Act. N. C. Tom. 2. Obs. 106.

cially as I perceiv'd there were others also in the belly: and the noble father of this virgin said, after he had heard my opinion, I believe you have judg'd but too well; for having lost a girl, the sister of this, by a similar disorder, and having order'd her lungs to be examin'd, after death, it was reported to me, that they were beset here and there with tubercles. And the very same writer will, by his observations, which are even extant in the Sepulchretum (*i*), shew that he has frequently found these tubercles in the lungs, and indiscriminately in all parts of them. One of these observations (*k*) demonstrates a threefold variety of matter comprehended in these tumours, since it represents some as being fill'd with pus, others with a honey-like substance, but the greater part of them, and these of the lesser kind, with a steatomatous matter; of which kind, probably, was the matter that Valsalva saw in the larger tubercles of the boy, of whom mention was made just now (*l*), which in its colour and consistence resembl'd the medullary substance of the brain. But others, also, contain a different kind of matter, as for instance, not to digress too far from the virgin spoken of by Valsalva, in appearance almost like a pultice. But these, or other appearances, we have in the advance of the disease, according to the variety of the causes and constitutions; for before the disease has made some progress, as you perceive from the inspection of that virgin, these tubercles are solid, and resemble conglobate glands. And, indeed, they may, in the first years of their existence, be so small as to escape the notice of the senses, in great measure, and yet discover themselves as the patient advances in life, and be so much the sooner encreas'd, and become perfect, as such causes shall the sooner come on; as for instance, in the same virgin, that fright, which shall retard the motion of the humours in the lungs, that are already thick and viscid, and, in other respects, dispos'd to stagnate.

20. And I think, in concert with Sylvius (*m*), that in this manner chiefly an inbred phthisis is produc'd, such as would have happen'd in the boy that is taken notice of; but differently in different persons, and at different times, according to the various disposition of the firm, or fluid parts in the lungs. For according to this variety, we also see, that an adventitious consumption may, on the other hand, easily have its origin in some persons, (the same accidental causes being suppos'd, which either do not at all injure the greater part of constitutions, or but little, and slowly) and very soon come to a dangerous height. Nor is it to be doubted, but that the lungs, if they are very sound, may resist the causes which would, otherwise, infallibly produce a consumption. And causes of this kind are inflammations of the lungs, and wounds, if both of them are ill-cur'd, and others, and amongst these such extraneous bodies as fall in from without; as for instance, the globular body which got into the aspera arteria of a boy six years old (*n*), in reading of whose history, you will naturally suspect, that there is some great inaccuracy, owing to the carelessness of the workmen; for a globule "little less than a walnut" could not have got in there, and if it had, must have brought on a very

(*i*) Additam. ad Sect. 7. l. 2. Obs. 34, 36,
37, 38, 40, & 43.

(*k*) 38. (*l*) N. 17.

(*m*) Cit. supra ad n. 17.

(*n*) Vid. Eph. N. C. Cent. 4. Obs. 121. in
Schol.

speedy suffocation, and not a slow disease, from which “the lungs” could “be fill’d with pus.” There is also another cause; I mean, quantities of cold liquor swallow’d down, while the body is very hot from too great exercise; a circumstance generally very pernicious, though not from the injury of the lungs only. For, to say nothing of the reservoirs, or large channels of blood, that lie near to the œsophagus, Lentilius (*o*) contended, that the stomach, into which the draught is receiv’d, was first injur’d from thence, in a consumptive boy, and not without some appearance of probability. And though I do not contradict his opinion in that case, nor in others, perhaps, in which the injuries of the stomach are observ’d to be much prior to those of the lungs, so that a bad digestion is brought on, from whence viscid and acrid juices are prepar’d, which not only excite a cough, by vellicating the stomach, but at length, by stagnating in the lungs, and irritating them, give rise to a consumption, in which way he himself would have chosen, perhaps, to explain the observation, if not of Vaterus (*p*), at least of the celebrated Heister (*q*); I say, though in some cases I do not much argue against his opinion, yet even in these very cases it cannot be denied, that the then parietes of the aspera arteria, and beginning bronchia, which adhere to the œsophagus anteriorly, and the neighbouring parts of the lungs, on both sides, are either immediately injur’d from a great quantity of cold water falling on, or betwixt them, when the body is extremely hot, or are, at least, vehemently dispos’d to receive such injuries as could not have happen’d without some preceding one.

These, therefore, and other causes, whether inbred or adventitious, bring on consumptions, and destroy in various proportions, according to the variety of these causes, and the strength of the constitution: and this you will perceive, by examining either the observations that are transferr’d into the Sepulchretum, or others, that I have, from time to time, pointed out, or shall immediately refer to. In the greater part of them you will find pus, in such a quantity, as to fill and stuff up the lungs (*r*): on the other hand, in some there was scarcely any trace of it (*s*); and even in the greater number of bodies, that were dissected by a certain surgeon, as you will read in the Sepulchretum (*t*), none at all. And if you suppose with Sylvius (*u*), that this happen’d for the same reason, as external ulcers are also dried up, in dying persons, I shall not controvert your opinion; though I should not so readily coincide with you, if with the same author (*x*) you in general assert, that “if any one dissect the bodies of consumptive patients, he will not find so great a quantity of pus in the lungs - - as to give reason for any one to “suppose the patient could have been suffocated from thence.” For the dissections of others argue the contrary; and among them, to pass over some of those just now referr’d to, that of Rodericus a Fonseca (*y*), and another

(*o*) Eorund. Dec. 3. A. 7. in Append. n. 10. ad Obf. 6.

(*p*) Dec. ead. A. 10. Obf. 161.

(*q*) Eorund. Act. Tom. 1. Obf. 174.

(*r*) Eorund. Cent. 4. Obf. 116, & 118. & Act. Tom. 1. Obf. 59. & Tom. 2. Obf. 19. & Haller Opuſc. Pathol. Obf. 15.

(*s*) Act. N. C. Tom. 4. Obf. 47.

(*t*) Sect. Act. 7. Obf. 77.

(*u*) Ibid. in Additam. Schol. ad Obf. 2.

(*x*) Obf. ead.

(*y*) Comment. in Hipp. l. 7. Aph. 16.

of the celebrated Jo. Adam Gorizius (z). Whose observation sets forth, that a purulent matter stuff'd up the lungs and the bronchia, some of it "being white," some of it "greenish," and another part of it "like the dregs of small beer;" and the famous Daniel Hoffman (a) saw it "of a brown colour:" and, finally, the illustrious Haller (b) saw it "corrupted, and black to such a degree, as to be like ink."

But it is superfluous to mention those cases, in which, when the lungs were cut into, blood mix'd together with pus and sanies flow'd out. Nevertheless, as Tozzius (c) has asserted his having more than once observ'd "those who died of a consumption to have been brought to so great a decay of their blood, that such a quantity only remain'd in the veins and arteries, as was scarcely sufficient to carry on the circulation, the rest being totally exhausted;" lest you should believe this to be universal, it must not be pass'd over in silence, that in a consumptive woman (d), in whom, by reason of the very emaciated state of her whole body, the skin seem'd scarcely to adhere to her very thin bones, the lungs, when cut into, pour'd out "a large quantity of blood," mix'd with sanies: and I must also add, that in two other patients, one of whom had expectorated pus, both of them had a great quantity in their ulcerated and putrid lungs (e), notwithstanding they had discharg'd a vast quantity of blood from their mouth and nostrils, and the second of them, moreover, from all parts by which hemorrhages happen; and yet that the carcase of the second, nevertheless, shew'd, in the left kidney, "a great stagnation of blood, and, in the lumbar region, "had the sanguiferous vessels very tumid and inflated;" and that the blood-vessels of the first "were very turgid with blood in the omentum, stomach, "and mesentery." But to return to my subject: pus and sanies have a different nature in different persons, as well as a different odour, and exist sometimes separately from, and sometimes in conjunction with, the indurated parts of the lungs. Which you will not only perceive from the greater part of the observations already pointed out, but also from those which I shall continue to point out. Thus, in a young man (f), the concave part of the lungs was loaded with pus, and the convex part almost tophaceous: and in a man (g), the right lobe contain'd a fluid pus, and the left a certain indurated matter. And as in some (h), the lungs were full of cartilaginous scirrhi, or beset with hard steatomatous tumours, and, in others, found to be fill'd with very small purulent abscesses, of the bigness of hail-stones, or made unfitly with a vomica, or vomicæ (i); so they were at other times callous, and compact at the same time; at the same time beset with vomicæ here and there, and in like manner (k) entirely obstructed, and exulcerated; or (l) stuff'd up with innumerable steatomata and vomicæ in several parts; or, finally (m),

(z) Eph. N. C. Cent. 8. Obs. 19.

(a) Eorund. Act. Tom. 2. Obs. 2.

(b) Obs. cit. 15.

(c) Comment. in Hippocr. l. 7. Aph. 16.

(d) Eph. N. C. Cent. 7. Obs. 83.

(e) Eorund. Act. Tom. 1. Obs. 173. &

Cent. 10. Obs. 36.

(f) Commerc. Litter. A. 1731. Specim. 46.

n. 5.

(g) Eph. N. C. Cent. 3. Obs. 2.

(h) Vid. Halleri cit. Obs. 15.

(i) Commerc. Litter. A. 1743. Hebd. 30.

n. 11. & A. 1745. Hebd. 24. n. 1. ad V.

(k) Act. N. C. Tom. 2. Obs. 8.

(l) Eorund. Dec. 3. A. 9. Obs. 243.

(m) Dec. ejusd. A. 7. Obs. 9.

defac'd with a great number of apostems and tubercles, some of which seem'd to be inflam'd, others as yet immature: such as I have already spoken of in the virgin describ'd by Valsalva (*n*).

21. And although, in the great number of examples which I have referr'd to, and in others which, as the disease is very frequent, are almost innumerable, there appears so great a variety of causes and effects; yet if you omit at present this variety, which depends upon the particular circumstances, and seek to find out one common origin of all the effects which you see, you will readily acknowledge this to reside in some tumour, which either by reason of an inbred, or adventitious cause, of whatsoever kind it may be, stagnating in the lungs, soon grows hard there, so that it be pretty thick, and the thinner particles fly off, and for this reason, sometimes give rise to the stagnation of some humour there, which is worse than itself, and more likely to erode; so that, if it be of itself already acrid, or if by stagnation, and admission of other humours, it becomes acrid, it begins sooner or later to erode the membranous cellules of the lungs. And when once a cellule is eroded, the disorder is propagated to the next; and when many are consumed, an evident cavity of an ulcer is made, which may be shut up all round by indurated parietes, made up of the membranes of the surrounding cells, which are compress'd by the pus, and for that reason, made thicker than natural, as we see by external ulcers, particularly in those of a fistulous kind. Nor yet can it be denied, that the extravasated humours, and especially those which abound with fibrous particles, as they are call'd, having deposited these particles, and they being agglutinated to the parietes of the cavity, form to themselves a cyst, out of a false membrane of that kind, as the celebrated Maloet (*o*) shews. And Valsalva, in a certain Italian paper, among the observations he had taken from those who had been wounded in their lungs, did not doubt, but nature sometimes produc'd a kind of membranous filaments, which had been seen by him twice or three times, and which being encreas'd, in process of time grew into a firm follicle, that contain'd an effus'd pus, as he thought he had found in some, who had liv'd pretty long in the disease. Be this as it will, a pulmonary consumption may be brought on from other causes also, as you have very sufficiently learn'd, besides suppurated tubercles; nor are we immediately to conclude, if pus, or an ulcer contain'd in a peculiar coat, be found, that it is from a tubercle, the coat of which is remaining.

But should we believe that those tubercles are true glands, which every body naturally has, and even those very glands which they describe here and there, at the division of the bronchia, or within the lungs, and call by the bronchial glands? which, although they are naturally in themselves very small, may be encreas'd by accidental causes, particularly in those whom an hereditary disorder disposes thereto. Are we taught to believe it from that sign of a future consumption, which Morton has related in the following words (*p*)? "A continu'd discharge of black and viscid phlegm in a morning, inasmuch as it proceeds from the glands situated near the trachea,

(*n*) *n*. 18.

(*o*) *Mem. de l'Acad. R. des Sc. A.* 1732.

(*p*) *Phthisiolog.* l. 2. c. 2. ad *n*. 10.

" in the lungs, being fill'd with a blackish humour. Which symptom, as
 " it is common to scorbutic and scrophulous patients; so it shews that an
 " asthmatic consumption will, in process of time, follow." And lately indeed, it seem'd to a learned man, that these glands naturally discharg'd their fluid into the bronchia, " by reason of the expectorated matter being of the
 " same blackish colour with the juices of these glands." But natural spittings are not of a black colour; and I should think it was better to follow the same gentleman, where he has affirm'd that these glands " most certainly are of
 " the species of conglobated glands;" and also where he has, for this reason, denied " that they pour out their juice into the aspera arteria;" and in like manner, where he has rightly observ'd, that as some of them are sprinkl'd throughout both the surfaces of the pericardium, quite to the diaphragm, " they are remote from all communication with the aspera arteria." I, however, having cut asunder some of these glands, taken from the first division of the aspera arteria, and from four bodies which I successively examin'd; and having seen that these sections of the glands, when rubb'd upon paper, gave a colour to it of a fuliginous kind, just as if you should dilute the dust of charcoal with a large quantity of water; and that this happen'd in the same manner in the three first bodies, but that in the fourth carcase, which was that of a middle-aged man, as the others were, and had those glands no less found, nor less black internally and externally than the others, they yielded nothing but a yellowish colour, very dilute, and almost effete; I nevertheless found the neighbouring trunk of the aspera arteria, and the beginnings of the bronchia, which I open'd, to be tinctur'd just in the same manner in the three former bodies, as they were in this fourth, that is, to have nothing at all, or at least only a slight tinge of a blackish colour. For which reason, with whatsoever colour these glands may be internally ting'd, I do not yet think that I ought to depart from my constant opinion, but still remain in this persuasion, not easily to believe that they communicate with the cavity of that artery, especially as other glands are not wanting, which, as they evidently discharge their juice into that tube, and the beginnings of the bronchia (g), so they may afford a passage for this kind of fæcal blood into these tubes, as Willis (r) says, to whom some persons also were known, who threw up matter from the trachea of a black colour like ink; and some of the same kind were known to Salius, as he declares in his commentary on those words of Hippocrates (s): " A thick and fuliginous saliva is thrown up by the cough."

However, as I shall not deny that the bronchial glands may sometimes communicate with the bronchia preternaturally, when any erosion is made; so whether they are the same which constitute the tubercles, in the lungs of consumptive patients, I leave undetermin'd for that very reason which I spoke of above (t), that is to say, because I was scarcely ever willing to dissect lungs of this kind, and much less compare those tubercles and these glands accurately and diligently one with another, in reference to their particular

(g) Vid. Advers. 1. Tab. 1. ad F. & Tab. 2. Fig. 1. ad O. O. O.

(r) Sepulchr. 1. 2. S. 1. in Schol. ad Obs. 9. & ad §. 2. Obs. 105. hujus 7. Sect.

(s) De Morbis 1. 2. t. 117. (t) n. 3.

situation. For this reason then, I shall here give no more than one observation, which was attentively taken by me.

22. A woman, who liv'd in the country, who was forty years of age, had a tumour on the internal side of her right heel, which encreas'd to so considerable a size, as to equal that of a man's head. On account of this magnitude, and its beginning to degenerate from the nature of a steatomatous tumour into that of a cancerous one, the woman was receiv'd into the hospital for Incurables at Venice, and the tumour extirpated. But as it began to grow again, after the woman had remain'd there more than a twelvemonth, and complain'd of no disorder at all, that had any reference to the thorax, it happen'd that she was seiz'd with a pungent pain at the left part of it, which a fever, and difficulty of breathing accompanied. Blood was taken away once and again, on which a white crust form'd itself; fresh drawn oil of sweet almonds was given; nor other remedies which are generally of use in a pleuripneumony, were omitted. However, the fortieth day had not yet come on, from the time that the pleuripneumony began, when a difficulty of breathing attack'd the patient, attended with a sense of tightness, and suffocation; so that she was now under a necessity of lying with her head, and back, rais'd up pretty high in bed: and her pulse, which, when there was an inflammation, had intermitt'd, intermitted again still more. Nevertheless she had no pain, no cough, no spitting, no fever; except that in the last days of her life, a slight fever at length came on: by which, and by the difficulty of breathing, that became more troublesome at the same time, and particularly in the night, the woman, being reduc'd to an emaciated state, and an extreme dejection of strength, so that she could scarce complain with a slender voice of an erosion in the fauces, in which no such thing however could be seen, died on the fifteenth day after the new difficulty of respiration had come on. Having heard this relation, both I and my friends, from the physician of that hospital, who was a diligent and worthy man, Senensis Rinaldi by name, and being entreated to it by all of them, and being assisted by Rinaldi himself, I dissected the body, being now about the beginning of April 1708.

Having begun to open the chest, and cut through the cartilages by which the ribs are join'd to the sternum, a bloody water issu'd forth from the left cavity of the thorax, which I presently saw fill'd again with the same fluid. I did not doubt, although no strong smell issu'd from this water, or from the lungs, but that pus had been mix'd with it, as I saw that the lungs at their lower and anterior parts were corrupted and consum'd, a great cavity offering itself readily to the eyes in that place. But when this lobe was dissected, it shew'd here and there, to very considerable tracts, a substance, which at first sight, and on the first examination, resembl'd a steatoma, that is to say, by its whiteness and firmness; but when you mov'd it with the knife, it was more like a purulent matter. The remaining part of the lungs was not at all hard, but ting'd of a red colour, as if from blood stagnating in them. The right lobe was much less diseas'd than the left, inasmuch as it conceal'd within its own substance, which was not altogether sound indeed, yet but slightly affected, fewer of those steatomatous kind of tumours, which were also less in their size, and seem'd to be shut up in their own peculiar coats. However,

ever, both lobes of the lungs adher'd almost universally to the parietes of the thorax, though the right adher'd the most closely. In the pericardium was a great quantity of turbid and yellowish water. In all the cavities of the heart were polypous concretions, which were produc'd from thence through the great vessels, and were all of a moderate firmness; but that was the least, which belong'd to the left auricle.

The belly was very livid before it was open'd; but when it was open'd, it appear'd that this lividness was owing to the intestines being turgid with air. Of the omentum there were scarcely any remains. The liver was somewhat hard, white, and variegated; and the gall-bladder extremely full of bile. The spleen was very large, and harder than it ought to be. The pancreas was also very hard. The ovaria were hard, white, and considerably large, and had in them some black cellules. Although within the higher part of the vagina, I found a ring of the kind commonly call'd a pessary, so that it appear'd the woman had been subject to a prolapsus of the uterus and vagina; yet when this ring was taken away, I did not find the vagina to be by any means so lax, that it should seem possible for it to be inverted downwards easily, and I saw the uterus in its proper situation; for which reasons I suppos'd that the woman had receiv'd much benefit from the assistance of this ring, and the recumbent posture of the bed. As to what remains; a turbid water had stagnated in the belly; but not in great quantity.

23. Here you have an example of an empyema, and a consumptive disposition in the lungs at the same time. I will give you another of a consumption, in which a small bone was discharg'd by coughing. Not that I dissected the body; for they who attempted to do this, unknown to the relation of the man, could not even themselves go through with it. But besides that I was sure I could depend upon their veracity, the patient himself, and his complaints, in like manner, were very well known to me, when I liv'd at Bologna.

24. A physician, of a middle age, who had long had a cachectic appearance in his face, and afterwards became short of breathing also, and hoarse, at length began to spit up a variously-colour'd matter, with which he also cough'd up a little curv'd bone, not very small in its size, that he shew'd to me, being smooth on the hollow part, and rough on the convex side. In the mean while, he was seiz'd pretty frequently with a sense of suffocation. At length on a certain night, when he had said that he found himself better, he was, a few hours after, found dead; the person who, for the sake of attending upon him, lay in the same bed, having perceiv'd nothing at all of it, and for that reason having slept.

The lungs were beset with vesicles, both internally and externally, which were full of white pus, and unequal; but did not, when largest, exceed the size of a grape. In the pericardium was much turbid water. In the heart was no more than one very small polypous concretion. The higher part of the trunk of the aspera arteria and larynx, it was not in their power to cut into, for the reason abovemention'd.

25. And yet it was most necessary to examine into those parts, that it might be found out from whence that little bone had proceeded. For there were different opinions upon this head, some foolishly taking it for a small
part

part of the os hyoides, and others for a portion of a ring of the aspera arteria, that had become bony: which latter opinion, probably, came the nearest to the truth, since Blasius (*a*) found even a small branch of this tube converted into bone, in the lungs of a consumptive patient; and I have observ'd not only the rings of that artery to have become bony, from a cartilaginous state, but also those little segments of circles, which are to be met with in great numbers, within the lungs, and are substituted in the place of rings, as I have already written to you (*x*): and Bontius (*y*) affirms, that a consumptive man, in his knowledge, "was accusom'd to spit up in great quantity" fragments of the bronchia, of the same kind with those which were found in the sanies within the thorax, and had been torn away from the corrupted lungs. Nor was Hippocrates ignorant of this (*z*), when he wrote *spit pus, & velut ulceris vicinos bronchie in pulmone cartilaginosa*: upon which words, see what Salius (*a*) has added in regard to the present question. And Aretæus (*b*), when he speaks of those persons who labour under abscesses of the lungs, has come still nearer to the case I have describ'd. For he has said, that "they grow hoarse, and breathe short; and sometimes it happens, that they are strangl'd by the sudden attraction of a great quantity of moisture, because the artery being obstructed by the multitude of pus, does not admit the air:" and that, by these persons, "the bronchia, that is, the circles of the aspera arteria, are sometimes spit up, by reason of the different situation of the ulcer, when the abscess penetrates deep: at which time fragments of this viscus are also expell'd." Yet this author also meant the little pieces of the bronchia, which lie hid within the lungs, as the last words shew. But that piece of bone which was thrown up by the physician, could neither be compar'd with those smaller pieces of the bronchia in figure, nor in magnitude; so that it must of course be refer'd to the larger annuli of the aspera arteria. And indeed Valsalva suspected, that it had been separated from the larynx itself, the larger cartilages of which, we know, frequently become bony; ascribing the sudden and unforeseen death of this physician to a considerable disorder of the larynx, for this reason also, because he had observ'd, that two patients in the hospital of Incurables, the one labouring under an ulcer, and the other a cancer of the larynx, had both of them died suddenly, and when he but little expected it: to which class you may also refer the case of the virgin that I have describ'd to you before (*c*).

26. Mention being made of the larynx, calls to mind that very trite and common opinion among the ancient physicians, of an acrid matter distilling from the head upon the larynx and the lungs, and at length bringing on a consumption. With which I should not deny sometimes to agree, if by the term head, we meant only to understand the roof of the pharynx, and internal nostrils. For that the glandular coat, with which these parts are furnish'd, does sometimes secrete a humour that is capable of eroding, the erosions, which do really happen in these parts, seem sufficiently to prove; from

(a) Sepulchr. l. 2. S. 7. Obs. 164.

(x) Epist. 15. n. 18.

(y) Sepulchr. S. 7. modo cit. Obs. 12.

(z) De Morbis. l. 2.

(a) Comment. in ejusd. l. t. 119.

(b) De Caus. & Not. diuturn. Affect. l. 1. c. 10.

(c) Epist. 15. n. 13.

whence both myself (*d*) and others have sometimes observ'd a spitting of blood to have its origin; which proceeding from what they call the hæmorrhoids of the mouth, might impose upon the physician for a pulmonary hæmorrhage, if he were not attentive to the signs formerly laid down by Hippocrates (*e*), by Aristotle (*f*), and by Cælius Aurelianus (*g*), and learnedly illustrated by Helwichius (*h*), with the addition of his own observations; to which you may also add another of the celebrated Dethardingius (*i*). Wherefore if the moveable palate below, and the uvula which is added to this, do not avert the humour from the larynx, as it falls down from the higher parts which I have mention'd, and is endow'd with a corrosive property, nothing forbids it from entering into that tube, and causing disease, and at length erosion there, and in the lungs. For which reason, the observations of more than one physician and anatomist shew that they, in whom that part of the palate and the uvula are consum'd by the lues venerea, or any other cause, are subject to a cough and consumption; as you will learn from the writings of the celebrated Jo Zacharias Petsche (*k*), and even from ours also (*l*). Nor will you imagine, because it has happen'd to me to see it otherwise, or because I have hinted, that what I have seen may be otherwise explain'd, that therefore the explanation which I have just now taken notice of, and which I even glanc'd upon then, is entirely dissatisfactory to me. And, indeed, taking this explication for granted, I confess that we may better understand why Mercurialis (*m*) and Gavassetti (*n*) prescrib'd a supine posture of the body, with the head bent downwards, in order to avert very violent and tedious defluxions from the head into the thorax, and rather promote their discharge into the œsophagus and stomach. For by this means, the first of these gentlemen recover'd a German woman, without the assistance of any other remedy; and the other so far was of use to a virgin, who already spat blood, to a considerable degree, from this cause, and was given up by the most eminent physicians, and deplor'd by all as lost, that he was afterwards able to cure her, even perfectly, by other remedies.

27. But Aetius (*o*) taught us to cure ulcers of the aspera arteria, by keeping the patient "in a supine posture, and by raising the pillows that lie "under the head to a considerable height," I believe when nothing flow'd down into the larynx. And he asserted, even in dependance upon his own experiments, that those ulcers, especially near the extremity of the aspera arteria, or in the extremity itself, "were certainly curable." For which reason, it is proper to take care, lest some examples of a consumption being cur'd, should not relate to the ulcers of the lungs themselves, but rather to those of the aspera arteria. And this I would not have understood to be said so much of the cure of others, as of a certain cure of my own, by which I got great reputation, when I was a young man, and practis'd physic in the place of my nativity. I will give you a description of the case.

(*d*) Epist. Anat. 9. n. 14.

(*e*) Prædict. l. 2. n. 27.

(*f*) De Partib. Animal. l. 3. c. 5.

(*g*) Morb. Chron. l. 2. c. 11.

(*h*) Eph. N. C. Dec. 3. A. 9. Obs. 118.

(*i*) Earund. Cent. 7. Obs. 73.

(*k*) Sylloge Anat. Obs. § 87.

(*l*) Epist. Anat. 9. n. 9. & 10.

(*m*) (*n*) De indicat. Curat. c. 52.

(*o*) Medic. Tetrabibl. 3. Serm. 1. c. 64.

There was a man of Lucca, by name Stephen Cheli, of a tall stature, and a spare habit of body, who was diligent and industrious, constantly employ'd in business of great importance, and burden'd with many cares; and for these causes also, hypochondriacal. This man had long been troubl'd with a cough, which was attended with expectorations tinctur'd with blood. The elder physicians having attempted to cure this disorder, at one time by the juices of softening herbs, and such as are suppos'd to be of use to the lungs; and sometimes by asses milk; sometimes by jellies of different kinds, and the broth of tortoises; and at other times by dilute decoctions of the woods, or by such medicines as being prepar'd from steel, or the lapis hæmatites, have an astringent property; besides the drinking the waters of the baths of Villa, and bathing in river water, and other remedies of a similar kind; were so far from gaining any advantage, that they made the patient still more emaciated, and the disorder itself more considerable; for the astringents seem'd to diminish the quantity of urine, and the baths to encrease the quantity of blood in his spitings; and the waters of Villa were under a necessity of being left off, within the few first days trial, because they did not at all pass off; and, in short, the patient's stomach loath'd almost every thing. At length, when the patient was as much tir'd of the physicians, as the physicians were of the disease, he came to me; but from a principle of reverence to my seniors, and being also influenc'd by the opinion of every one, in regard to the desperate state of the disease, I made use of many apologies to decline taking upon me the management of the disease; till at last, being overcome by the authority and persuasion of those who had the health of the patient at heart, I consented in such a manner as to convince every one that I took him under my care against my own will, and without promising any thing, in compliance with the desire of other persons, and in order that the patient might not be deserted, rather than with a view to the cure of his disorder. For he was very thin and weak, and got but little, and that disturb'd, sleep. Yet when I found that a fever, or at least a continual one, did not attend the disease, and according to the words of Aetius (*p*), "a small quantity of purulent and bloody matter was thrown up by spitting;" and that "a sense of pain was manifestly perceiv'd" in no other place, but "near the ulcerated part" of the aspera arteria, that is, a little below the larynx: and when I also found, that out of all the remedies which had been made use of, two of them had been of some advantage, which are recommended by Aetius (*q*) against those ulcers of the aspera arteria; I mean, "medicines laid under the tongue, so that being melted by degrees, they may fall down into the aspera arteria; and milk drunk every day, as it is milk'd from the animal, while standing by the patient;" I began to cherish some little hope tacitly, and to endeavour to find out the method of bringing about, that the same remedies which had been of some advantage, might at length perfectly cure. They had us'd troches, which were dissolv'd in the mouth, made of the species *diatragacanthi frigidæ*, and asses milk; by which the sense of pricking, in the aspera arteria, was at the time they were applied, almost entirely taken away, and the strength of the patient somewhat

(*p*) c. 64. cit.(*q*) Ibid.

increas'd by sleep. When I ask'd him why he did not persist in the use of those things, which had been of service to him, he answer'd that his stomach was hurt by the troches; and as to the milk, though at first that advantage seem'd to result from it, yet all the symptoms return'd soon after. But in the mean while, said I, "did you avoid the wind, and the sun?" for I remember'd that this was expressly prescrib'd by Hippocrates (r), to those in whom the *fistula pulmonis*, or "aspera arteria, was affected with a hot ulcer, "call'd aphtha." But I found that he had not avoided them: and I perceiv'd also that these troches had, by their sweetness, naturally hurt the stomach, inasmuch as it was the stomach of an hypochondriacal person. After having determin'd then with myself what was to be done, and what was to be avoided, it happen'd accidentally, that I had it in my power to communicate my intentions to Paul Piella, an eminent physician at Bologna, who at that time, together with myself, attended the count John Baptist Urli, afterwards bishop of Cesena, who lay ill of a very violent disease. But Paul, although he did not disapprove what had been propos'd by me, yet having attentively examin'd the spitings, and heard that they were so thin, and in so small quantity, and yet not always, but that they were now and then bloody; I fear, said he, very much, that you will not be able to heal these ulcers, which, besides their being, probably, very deep seated, certainly, if I see at all into the disorder, come near, in their nature, to that kind of herpes, which, if it were even on the surface of the skin, would be brought to a cicatrix with the greatest difficulty. This prognostic, as it was made by a well-experienc'd master, in chirurgical matters in particular, made me rejoice that I had promis'd nothing, but did not prevent me from making the trial of what I had determin'd to try. It was now the time of year in which it was peculiarly necessary to avoid the injuries of the external air with the utmost caution; nor could much be hop'd for from the milk of brute-animals, by reason of their provender being unfit for them.

First of all, then, I order'd the patient to shut himself up in a warm chamber, not low, nor close; and there giving up every kind of concern, rather to hear his friends and acquaintance, than to talk much himself; and when he did, to speak in a low tone, and by no means quick. Then having prescrib'd such things as might tend to soften the aspera arteria, nor yet hurt the stomach, and the stomach being prepar'd for the use of the milk, I order'd woman's milk, not in great quantity at first, for the sake of trying how it would agree; and afterwards, when I found that it succeeded very well, I order'd as much to be suck'd from the breasts, as to the patient himself, who was sagacious and attentive, would nearly equal half a pint, in the morning, and in the evening; that is, about four or five hours before dinner and supper. Both of which meals were moderate, but the supper in particular; and wine, or any thing else that might be injurious, was avoided. His dinner and supper frequently consisted of a pudding made of barley-flower, with an addition of the powder of the china root, in the proportion of one ounce to the pound, but without any sugar: and these ingredients

(r) D. Morb. l. 2. t. apud Salium 112, & 114.

being mix'd up with milk, fresh drawn from a cow which had been fed upon barley and chaff, not upon beans and hay, were reduc'd into a kind of calx, as it were, over a slow fire. I took particular care also to have a nurse who was in good health, and order'd her to make use of proper aliments, and as much as possible to avoid variety of them; which circumstance, when neglected, seems to be the only reason, why the milk of women is not better than the milk of other animals for medical purposes; although even the ancient physicians, and in particular Euryphon and Herodotus, who are commended by Galen (*s*), "prefer'd it to others in consumptive disorders, as "it was familiar to us, and of the same nature with ourselves." By observing this regimen very strictly, from the end of November to the middle of May, the patient was so far recover'd as to be extremely well for sixteen years after. At the end of which period, his blood being again loaded with eroding particles, deposited them upon the skin, for the space of two years together, in the form of a tetters eruption. But these eruptions going off all of a sudden, the bottoms of his feet were seiz'd with very acute pains, attended with some tumour, and considerable redness. Which disappearing of a sudden after twenty days, a suppression of urine came on for the space of two; and after this a swelling of the legs, which often vanish'd, and as often return'd; and a fever of an inconstant period; and at length, betwixt the navel and the pubes, a kind of hard internal protuberance, besides other complaints of the belly; with which being grievously afflicted, he finally exchange'd disease for death. But all these things happen'd when I was absent: which I mention only for this reason, that you might understand my cure to have been perfect, as the patient not only continu'd well for so long a time, but even after he began to grow ill again, among so many disorders, never was attack'd with the first. Which being generally esteem'd to have been a consumption, there was no consumptive person in the city who did not prescribe the same method of cure to himself; yet not one of them escap'd.

28. There are, also, much deeper disorders of the aspera arteria, which the common people very often, and even the physicians sometimes, confound with the consumption; though at the same time the lungs, in these persons, are sound. Thus, not to repeat the observations which I have already written to you (*t*); thus, I say, I remember Valsalva to have asserted, that he never saw lungs in a better condition than those of Zani, bishop of Imola, were; though they were generally suppos'd to be diseas'd, by reason of the great quantity of humours that he expectorated, which were secreted, without doubt, from the proper glands of the bronchia. Which, notwithstanding they are, in fact, not purulent, yet sometimes are of such a nature, that if any one should contend for their being purulent, he might very easily find some one, amongst that great number of "forms and species of pus," which Arææus (*u*) enumerated so as to say, "that they were almost infinite," to which he may seem, with some reason, to refer them. And I could wish, as doubts do sometimes arise, that signs and marks of the true pus were

(*s*) De succor. bonit. & vit. c. 4.

(*t*) Epist. 4. n. 21. & Epist. 10. n. 11.

(*u*) De Caus. & not. diuturn. affect. l. 1. c. 9.

extant, which should be always certain, and which all persons would agree upon. For as to Jacotius (*x*), for example's sake, distinguishing pus from phlegm in such a manner as to say, that the former is cineritious, and the other white; the one foetid, or at least moderately so, but the other not at all; and, in short, the one dividing into parts, especially if thrown into water, but the other glutinous; I do not sufficiently understand, by what means he can reconcile all these assertions with the doctrine of Aretæus, who, when speaking of the various kinds of pus, had expressly plac'd amongst them even that which is "glutinous, and without odour;" particularly as Aretæus has done this in the very place where he is commended by Jacotius, for judging "that pus could be distinguish'd from mere phlegm by the sight" only; and that they were not much skill'd in the knowledge of suppuration, "who examine these expectorated matters by the fire and by water;" taking notice, at the same time, how they abuse the aphorism of Hippocrates (*y*), repeated in the *Coacæ Prænotiones* (*z*), and another added in this last work (*a*), in order to make the diagnosis of pus; since neither of them, as Jacotius rightly admonishes, was written in order to distinguish pus, but both of them, evidently, in order to make a prognosis of death; whether the spitting of the consumptive patient, when put upon the fire, smell very strong, or subside, when thrown into sea-water which is contain'd in a brazen vessel. And although Duretus (*b*) and Jacotius himself have both endeavour'd to give a reason, why Hippocrates thinks such a vessel necessary, yet I fear they have not done it sufficiently to their own satisfaction, not to say to yours: and, without doubt, the latter of them at length comes back to this, that, to follow the opinion of Hollerius (*c*), he thinks it is but of little consequence in what vessel that water may be contain'd; but whether this supposition agrees with the great brevity of Hippocrates, you yourself will see. And John Jerom Zanichelli, a man of much experience, both in the medical and chymical art, conversing with me, at Venice, about a very learned friend of both of us, Victorio Francesco Stancario, who was already attack'd with a consumption, at Bologna, in consequence of a cough and spitting of blood; and mentioning two consumptive patients that were cur'd by an eclegma; the one by that which is call'd the *rob* of nuts, and the other by the *rob* made from ripe elder-berries, prepar'd in a certain manner; nor concealing what he himself look'd upon as an arcanum, balsam of sulphur prepar'd with balsam *copaiba*; and having happen'd to digress from thence to this passage of Hippocrates, as frequently happens in discourse, he declar'd it to be his opinion, that by a brazen vessel something was taken from the sea-water, so as to make it less able to resist the descent of the expectorated matter, than if it were to be contain'd in any other vessel but a brazen one: nor is pure water proper in order to make this experiment more easily and certainly, nor yet sea-water, as many suppose; for the former resists the descent of the matter less than it ought, and the latter, in any other but a brass vessel, somewhat more than is requir'd. And he affirm'd, that the prediction of

(*x*) Comm. 1. in l. 6. S. 2. Aph. 9. Coacar.

(*y*) Sect. 3. 11.

(*z*) Aph. modo cit.

(*a*) Aph. 10.

(*b*) In Coac. l. 2. c. 17. n. 3.

(*c*) Comm. in cit. Aph. 10.

Hippocrates had alway answer'd, on his frequently making this experiment, in the manner that Hippocrates prescribes: nor did those whose spittings had floated in water, die in so short a time as they whose spittings had subsided: so that he did not doubt, but if the experiment were made afterwards, that is, when the disease was become much worse; he did not doubt, I say, but the spittings would fall to the bottom. Nor would he have the spittings collected together, as many do, and thrown out of a basin into water, but from the very mouth of the patient, according to the method of Hippocrates, and even from the very lungs of the patient, and that many times over; well knowing that the expectorated matter does not alway proceed from the part of the lungs that is most diseas'd; and, on the other hand, what alteration may happen to it, by lying in the open air some time after it is discharg'd; so that it may seem to be of quite a different nature in the experiment, from what it would have been immediately after its excretion.

29. But Cælius Aurelianus (*d*), where he takes notice of a great number of physicians who put the expectorated matter of patients into water, (he does not say sea-water) or laid it on the fire, not in order to make a diagnosis of death, but in order "to distinguish a purulent fluid;" and in like manner Cornelius Celsus (*e*), where he makes mention of them who made use of this second sign, when they were in doubt about a consumption; seem pretty clearly to prove, that customs of this kind did prevail: and the first expressly says, that in persons who have fall'n into a consumption from a spitting of blood, the expectorated matter from livid or greenish, "becomes white and purulent;" which is diametrically opposite to the first mark of distinction between pus and pituita, that is laid down by Jacotius (*f*). Besides, both these ancient physicians, whom most physicians follow, and indeed I myself in general, in this letter; in such a degree however, as not to commend those who think differently; did not call that wasting a true consumption, or phthisis, in which there are no sanious or purulent expectorations; not even though there were pus collected in the thorax and in the lungs. The first of them, therefore, taught that there was also this difference betwixt the "consumptive and the empyematic disorder;" as in this latter, pus is not thrown off gradually by spitting, but in large quantities at a time; and Celsus would not have said (*g*), "that pus is spit up" by consumptive patients, if he meant to have empyematic persons taken for consumptive patients. For in describing empyematic patients (*h*), and to those signs which Hippocrates had before given, adding, as Ronsseus (*i*) observes, something of his own, in relation to the veins that are under the tongue; he nevertheless made no change in regard to those things which are spit up. For he saw that Hippocrates, not only in that place of the *Prænotiones* (*k*), which Celsus particularly refer'd to at that time, but also even in the *Coacæ Prænotiones* (*l*), constantly plac'd this among the signs of persons being empyematic, "that they spit up nothing worthy of observation." And if, in ano-

(*d*) Morb. Chron. l. 2. c. 14.

(*e*) De Medic. l. 3. c. 22.

(*f*) Vid. n. 28.

(*g*) c. cit.

(*h*) l. 2. c. 7.

(*i*) Enarrat. ejusd. c. 7.

(*k*) n. 16. apud Marinell.

(*l*) n. 3. ante med.

ther book, I mean that which is entitled *De locis in homine* (m), before he taught us to conjecture that a patient was empyematic from this sign, that "he is short of breath, and speaks with a somewhat hoarse voice," he has said that the same person "spits up pus;" he meant that they did this differently from consumptive patients, or at least after different symptoms, as you will gather from the passage of Cælius already refer'd to: and without doubt, that the consumptive or phthical patients of Hippocrates were different from those who were empyematic, or suppurated, is very evidently shown from what he had said a little before (n); "that patients become suppurated from being tabid, or, as they are call'd in the Greek language, phthical, when the body has been made very moist: and on the contrary, that they become tabid from being suppurated, or empyematic, when the body has been made very dry."

30. But to return to that discourse from which I, perhaps, seem to you to have digress'd, you readily understand how easily men may be deceiv'd, in so great a difficulty of judging sometimes, and finding out what is really purulent; so that although it should be determin'd that a consumption should be allow'd to consist, not only in the hidden ulceration of the lungs, but in the evident discharge of pus by spitting, they may nevertheless frequently seem themselves to be right, in supposing that to be a consumption which is not so in fact. And this I say, not in such a manner as to deny that patients really consumptive have been sometimes cur'd, especially in the beginning of the disease, when a great quantity of pus is not yet collected in the lungs, from whence it has a free and open access into the bronchia: but I judge this to happen very rarely, more so than they imagine, who have had no experience how great a diligence of the physician, and how strict a compliance of the patient, at the same time, is requir'd, even to remove those disorders which are, perhaps, not true consumptions; although in most respects they may seem to be very similar thereto. A case of this kind I will describe to you here, in order to give you some satisfaction, by observations taken from patients when living, describ'd minutely, and at large, as I know you would wish them to be, because I cannot satisfy so much in this letter as I am us'd to do in others, by giving you dissections of morbid bodies. You will judge, when you have read over the successful cure of this disease, by what name it ought to be call'd.

31. The count of Feltri being every year subject, not only to troublesome complaints of the gums and teeth, as the rest of his noble brothers also were, but to ulcerations of the nostrils besides, and to itching disorders of the skin, which were of the tetterous kind; and having, in pursuit of the pleasure in which he took in hunting, expos'd himself frequently, through the autumn, to the morning's early cold, was taken with a violent catarrh, to which a cough was added; and at length, in the month of November, a spitting of blood. For which reason a vein was open'd; and as the hæmoptoe return'd, blood was taken away a second time; and goats milk was administer'd; and, in like manner, the jelly of ivory and of calves feet, which was prepar'd with water wherein hot steel had been frequently extinguish'd, and

(m) B. 28.

(n) n. 27.

other remedies that have an astringent and agglutinating property. This method being pursu'd through the whole month of December, the disorder seem'd to be overcome; though the cough return'd now and then. But in the month of March, all the symptoms were renew'd. For which reason decoctions were given in the morning, from such woods and roots as are generally recommended against defluxions, antiscorbutic and vulnerary herbs being added; and in the evening the antihæsticum polerii, as it is call'd, first with an emulsion of the cold seeds, and after that, with the aqua bardanæ. And having made use of these remedies, and other things of a similar kind, from the middle of March to the latter end of April, he again took the goat's milk, and at the same time, twelve drops of the balsam of Peru; and this regimen he continu'd about forty days. In the mean while one of his upper limbs had the actual cautery applied to it, and the ulcer was kept open. Although he at times perceiv'd some little alleviation, indeed, from these applications, yet the cough and the hoarseness very obstinately afflicted him: and indeed the cough had grown much more violent, and seem'd to arise even from the very bottom of his thorax; and his spittings, from being whitish and catarrhus, began now to be, at different times, of a different colour and weight, and of a different tenacity: to these symptoms, a certain sense of narrowness and constriction at the chest was added, and an internal heat at the sternum; the latter of which the patient complain'd of frequently, but of the former continually. All which appearances seem'd to be so much the more threaten'g, as the fauces, which had been before troubl'd with a defluxion, grew better from the time these symptoms came on; and at the same time the cutaneous spots became pale, nor caus'd any itching whatever; so that all the violence of the disease seem'd to have turn'd itself upon the breast. And it was now also perceiv'd by every one, that not only the strength of the body in general, in a man not two and thirty years of age, was much weaken'd, and that the liveliness of his face, the vigour of his eyes and understanding were diminish'd, and his flesh still more decreas'd, but that even the voice itself was made very weak. In this state was the disease, when I was consult'd by letter, in regard to his case, that is about the latter end of June; being strenuously recommended to the patient by one who had it in his power to command, the most excellent Angelo Emo, a Venetian senator, and that time governor and lord chief justice of Padua. There were many circumstances, as you see, that gave us reason to fear: yet others were not wanting, which I thought sufficient to prevent us from being quite out of hope; as for instance, easy sleep by night, a capacity of lying down on either side, his appetite for food not being lost, and the quickness of his pulse not being encreas'd after taking nourishment; no fœtid smell in his spittings, no sense of weight in his chest, no shortness of breath. And though just after this account had been sent to me, the patient expectorated, by means of the very deep and violent cough, such matter as had never been discharg'd before, being bloody and corrupted, and that five or six times over, yet I did not, for that reason, change my opinion; especially from the time I was inform'd, that the patient had made no complaint of the sense of heat and constriction, ever since this matter had been thrown up. I therefore determin'd to recommend various remedies, as the summer season at that time, and the various

rious causes and effects of the disease induc'd me, yet so that one might agree and co-operate with the other. There is no occasion here to recount the whole particulars of the treatment; or to tell you what I substituted in the room of some remedies which the patient did not seem to bear well; it is sufficient to point out to you such of them as were of most advantage, and, consequently, most freely us'd. Every day, in the morning, a little of the resin of turpentine was taken, by which the patient affirm'd that his fauces and breast were considerably reliev'd. After that, for the first twenty days, the aqua lactis, as it is now call'd, was drunk, in which were, and had been previously, macerated, brook-lime, ground ivy, flowers of St. John's wort, and a little of the bark of saffraſas; the drinking of which water was always repeated five hours after dinner. But after these twenty days, a draught of viper broth was substituted in the stead of the morning draught of this water, prepar'd also from frogs, and the tails of river-crabs. From the first use of which he evidently found advantage; for the spots on his skin, as I had wish'd, became again colour'd, and itching, and, at the same time, the colour of the face was better, and the strength somewhat increas'd, the habit of the body somewhat less thin, the cough less frequent, the hoarseness more slight, and the spittings less. His food was nothing else but young female chickens, or, as they are call'd among us, and as Varro (c), perhaps, has written, *pullaſtræ*, which having the belly stuff'd with the herbs mention'd above, were roasted, and pudding made of rice, or oats, together with almonds. At table he always drank water in which the radix chinæ, and the saffraſas bark, had been slightly macerated; and at other times the aqua Brandulæ, which in the summer-time, and when he was troubl'd with thirst, was allow'd him in a considerable quantity. By means of this regimen, the patient was able to come from the place of his nativity to Venice, after the middle of August, and, about the beginning of September, to Padua, to consult me again; full of hope, that, as I had so much reliev'd his disorder, by having it describ'd to me by letters, I should be able entirely to cure it, upon seeing, and examining into, its nature. It pleas'd me very much, that this confidence had succeeded to so great a fear in which he had previously been. And upon observing this gentleman, and his disorder, very closely, for two days that he was here, I was also pleas'd to find, that all the circumstances of the disease, which had given me reason to hope, still continu'd; and, likewise, that the conformation of the thorax shew'd nothing from whence I could conjecture that he was dispos'd to a consumption; for the shape of it was such, that it lay quite contiguous to the broad bones of the scapulæ, and did not, by receding therefrom, render them prominent like wings; also, that there was no hectic heat, no quickness of pulse, no thirst, no difficulty of breathing, not even when he went up steep places; at length, that his long and very obstinate hoarseness had now been entirely remov'd for many days. Yet his cough, spitting, and emaciated state of body, still gave me pain. For I found him to be more emaciated than I had suppos'd from the tenour of the letters that I had receiv'd. And his spittings, although nothing of a corrupt or bloody kind had appear'd

(c) De Re Rustic. l. 3. c. 9.

ever since the time of expectorating such matter which I have already mention'd, nevertheless, had not yet lost their yellowish and cineritious colour, especially in a morning, and their saltish taste: finally, his cough, although it was grown much milder, at other times was still troublesome in a morning and evening, and seem'd to arise from an irritation within the thorax, notwithstanding it lay pretty high. My solicitude was increas'd by the time of year wherein the disease had begun, being at hand, which the patient was, for more than one reason, oblig'd to spend, and the winter likewise, in the place of his nativity. And how early, long, and sharp, the cold is there, you may easily conjecture from the situation of it, and the ancient verse, which is suppos'd to be Cæsar's, confirms,

Feltria perpetuo nivium damnata rigori (p):

“Where its bleak face the rugged Feltri shows,
Doom'd to the rigour of eternal snows:”

whereas, in the age of Celsus, on the contrary, in disorders of this kind (q), “the patient went from Italy to Alexandria.” For which reason, I again and again inculcated, with how much care and diligence he ought to defend himself against these inclemencies, when he was there, and with how much care use those remedies that I recommended to him. And as, in the number of these, milk was the chief, first asses milk, and then cows, the patient having return'd home, and us'd the former for a month, saw his spittings so much chang'd for the better, that in quantity, colour, and all other conditions, they were now almost within their natural bounds; then leaving asses-milk, and going to that of cows, and persisting very long in the use of it, as I had order'd, if it seem'd to be of sufficient advantage to him, so as to take it quite to the latter end of December; and his spittings being now become entirely of a natural and healthy kind, and all irritation and troublesome affection of his thorax, or fauces, being entirely remov'd, he recover'd the former colour of his face; and both the habit and strength of his body, in general, was then in perfect health, and continu'd still so when I revis'd these letters, which was in the twenty-second year from the time he regain'd his health: so much was one single kind of remedy able to effect, by the singular blessing of God, in an unfavourable place, and season of the year, assisted by the great diligence and caution of the patient in taking care of himself, and by the equal studiousness and vigilance of Ludovico Alberti, a very ingenious physician at Feltri, and deserving of a much longer life; who, both in respect of diet and medicine, took care that every thing should be administer'd according to the opinion I had given; and whose letter written to me on the sixth of January, in the year 1740, related this successful event, which was extraordinary, and but little hop'd for by most persons who knew the patient. And this was also confirm'd in the succeeding spring, by the sight of the gentleman who had been ill, which was very pleasing to me; though if he had not made himself known, I should not have known him again. You have what I promis'd. Farewel.

(p) Apud Bembum in Rer. Venetar. Hist. l. 9.

(q) De Medic. l. 3. c. 22.

LETTER the TWENTY-THIRD

Treats of Palpitation and Pain of the Heart.

1. **A**S in the last letter you receiv'd, together with some dissections of Valfalva's, not more than one of mine; so, on the other hand, in this you will have some of mine and none of his; not, indeed, but there are many extant in his papers, which relate to the palpitation and pain of the heart, but because there seem'd to be a more proper place for each of them, in the letters which I have already sent to you, or am to send hereafter. For whether these indispositions of the heart have their causes remote therefrom, or in this viscus itself, or near it, in the former case it for the most part happens, that at the same time other, and often more violent disorders, discover themselves in other places; and, in the latter case, it rarely happens, that the heart is agitated with a palpitation, without other and greater injuries. For which reason, my observations, that I shall produce presently, will themselves also seem, in some measure, to relate to other subjects, in the same manner as many do in the eighth section of the Sepulchretum, which answers to this letter; nor yet those only of which Bonetus confesses it, when he expressly adds in what sections besides they have been before propos'd by him, or will be afterwards propos'd; but others also, and in particular those in respect to which the authors have either pointed out no disorder wherewith the patients were troubl'd, or have mention'd some other than that of the heart. To this class you will refer the eighth observation, in which (a) a scabies and dropfy only are mention'd; but palpitation is mention'd in the scholium in such a manner, that, if you attend to it never so closely, you do not certainly know whether it was, or was not, observ'd in the patient. And that observation the tenth and sixteenth are of this kind, even Bonetus himself does not deny; and, indeed, he readily acknowledges, in the scholia which are added to both, that there might be other disorders than what he treats of there. Yet in both places, although conjectures ought not to have been given instead of observations, you will, perhaps, better bear this, than that he should again repeat the observations which he had already produc'd in this, not very long, section, without being sensible of it himself. For that which we read under observation the eighth, article the third, is the same with what we find in the very first verse of observation the first: you will know with what accuracy other things are describ'd therein, when you take the trouble to compare it with the scholium of Hollerius himself, in the chapter quoted, which is in his first book.

(a) § 1.

4 R 2

Moreover,

Moreover, that which is first subjoin'd to the fifteenth observation, is the same as the first under the fifth; that in the eighteenth the same with that in the latter part of the first; that which is about the beginning of the scholium to the sixth article, under the twenty-first observation, is the same with that which is at the end of the scholium to the tenth observation. Finally, the girl who is spoken of under the second article of the fourteenth observation, is no other than the who is again spoken of under the eleventh article of the twenty-first observation; and, what you would not easily believe, if you did not yourself know it, in the eighth article of this last observation, it is the same boy that is again spoken of under article the ninth. Nor are there fewer marks of forgetfulness in the additamenta to this section. For if of those observations that are collected together into one under number three, you compare the two, one of which relates to a certain citizen of fifty, and the other to a nobleman, with those which Bonetus had produc'd above, under number twenty-one, article five, and under number fourteen, and in the beginning of the scholium added to this, giving their authors names at the same time, you will immediately know that they are the same; the latter being the observation of Riverius, and the former of Hildanus. Nor will Blancardus, who, in his *Anatomica Practica*, has given both of them (*b*), somewhat newly modified, as his own, or "from the relation of others (*c*)," having omitted some things, and even added others, which Hildanus had taken no notice of in the body, be able to disguise them from you, as you are so much the less likely to believe him, because even in the observation which immediately precedes them, in the Sepulchretum, he speaks of Ruysch as being "present" while he dissected, who shew'd afterwards (*d*), as you very well know, that he himself "had made the dissection." But to pass over Blancardus, with those little arts of his; to what purpose was it, in fine, to add to the observations describ'd from his book; which, let them be of what kind soever, do relate to palpitation at least; I say, to what purpose was it to add that observation, which, as it is of an asphuxia only, did not belong to this section, but to the next entirely? I, however, am not dispos'd to imitate any thing of this kind. I shall repeat no histories; and those which may seem to belong, rather, to other letters, I will defer till I send them: and, in particular, I will describe the dissection of no bodies, which either I, or my friends whom I can name, did not dissect. I shall begin with that which Jo. Francesco Bernardoni dissected at Modena; he who was afterwards archiater at that court, and who resided, together with me, at Bologna, for the sake of prosecuting his studies, at the time the dissection was perform'd, when he also related it to me.

2. A woman, who educated young children of noble families, was seiz'd with a palpitation of the heart. Blood being taken away from her arm, she was greatly reliev'd thereby for about two days. But these being elaps'd, the palpitation return'd with such vehemence, that the breast was perceiv'd to be lifted up by every stroke. At the same time there was such a pain in the thorax, a difficulty of breathing, and fever, as gave great suspicion of a peripneumony. Blood being again taken away from the arm, she receiv'd

(*b*) Obs. 35, & 75.

(*c*) Vid. ejus Præfat.

(*d*) Obs. Anat. Chir. 69.

not the least advantage therefrom. And having a vein open'd in her foot, she died within about an hour after, which was indicated by the pulse growing gradually less and less, from the time of being bled, and giving less resistance to the fingers of the physician, when he compréss'd the artery: but the pulse was, at the same time, more quick. A great quantity of blood flow'd from the mouth of the carcase. Yet in the thorax, and in the belly, every thing was found. The head, as no suspicion of disorder being there had arisen, was not dissected.

3. Although the disease and death of this woman, join'd together with this dissection of the body, are difficult to be explain'd, let us use whatever mode or order of explication we choose; yet I should believe that internal convulsions had in some measure, at least, conspir'd to her death. For tho' we should quite exculpate the brain, yet the nervous plexusses, and the nerves themselves, still remain to be held in suspicion. But who is able to enquire into the injuries of these parts, wherever it might be necessary? or indeed to distinguish these injuries, for the most part, by enquiry? which without doubt is the reason, that in the examination of bodies of this kind, they are very rarely sought into. Nevertheless, if a palpitation of the heart immediately succeed to some certain motions in the brain, as even happens to persons in health, under the influence of some of the passions of the mind, who can deny, if motions are made in the nerves, which answer in a just proportion to those motions of the brain; who, I say, can deny, but the same palpitation may then be brought on? For whatever the brain is able to perform in the heart, it is able to do only by means of the nerves that go betwixt itself and the heart, or the vessels nearest to the heart, by which, without doubt, these motions are propagated to the fleshy fibres of the heart, or the vessels; or, if you choose rather to consider it in that view, externally constringe the coats of these vessels; so that it now very clearly appears, that the same effect must of course follow, if the same motions which at one time begin from the brain, sometimes also begin from the nerves, that are interpos'd; just as in those persons, who after having a foot amputated, go on still to complain of a pain in that part, there is the same effect from a motion which arises in the nerves that are interpos'd, as there was a similar motion which arose even from the diseas'd foot. Rightly, therefore, did even our Saxonia formerly teach, "that a palpitation of the heart did not "only take its origin from the brain, but that it also, sometimes, arose from "the injury of the nerves alone, without any apparent injury in the brain:" which words you will also read subjoin'd to the forty-second observation in this section of the *Sepulchretum*, from which the position I made just now is, in other respects, confirm'd; I mean, that the natural motion of the heart is immediately chang'd from a certain change and motion in the brain. But if in a tender female infant, who is spoken of in the "*Commercium "Litterarium (e)*," no other appearance could in fact be found, to which the disorder might be imputed, but those polypous concretions, you will so much the more readily explain the palpitations of the heart with which she was troubl'd, by convulsions, from whencesoever these convulsions might

(e) A. 1744: Hebd. 42. n. 1. ad art. 15.

arise, because "she died of convulsions." However, these things, which I have said, you may also transfer to the nerves that communicate with those of the heart, or great vessels, so as to understand that these palpitations of the heart, which frequently happen in hypochondriacal and hysterical patients, in particular, do either altogether, or in part, derive their origin from thence. For the nerves, in bodies of this kind, are much more prone to run into sudden and irregular motions; for which reason we see, that these persons, above all others, are immediately seiz'd with palpitations of the heart, even from the slightest emotions of the mind. And although in three women, whose histories I shall immediately subjoin, you will acknowledge that there were some other causes of the palpitation, yet you will by no means doubt, but that has sometimes conspir'd together with the others.

4. The wife of a certain painter at Padua, of forty years of age, and the mother of four children, who was not accusom'd to any irregularities, either in eating or drinking, but being of a delicate constitution, and for that reason more irascible, nor, indeed, being without causes of anger and sadness, had, for a long time past, lost her appetite to food; yet was not deficient in her menstrual purgations, when she began to complain of a palpitation at her heart, with which she was troubl'd to the very day of her death, though in different degrees at different times. To this were added other complaints of a sense of erosion within the thorax, and at the spine of that cavity, and of a palpitation produc'd to the side of the spine, also of a very difficult passage of the aliments into the stomach, after they had already descended through the œsophagus, very near to the stomach; at length she complain'd of a pain in the nerves, as she herself said, and particularly in the arms: as to the other symptoms which attended the disorder, an œdematous tumour began also to come on, that was particularly conspicuous in the lower limb on the right side; and by this, among many even eminent physicians, the opinion of an aneurism of the aorta was confirm'd. Others, on the contrary, as they observ'd that the patient could lie down easily on either side, and that the pulse was not tense, or intermittent, and similar in both arms, attributed all these symptoms to an hysterical disorder; and that with so much the more readiness, as they knew that she had been in the mean while seiz'd with a kind of paroxysm, in which the women found her with her teeth closely shut; and they said also that they had frequently perceiv'd her to be cold in many places. While these controversies were agitated, the woman, finally, having her pulse already diminish'd, died as she was speaking.

Having heard all these circumstances accurately related by my most excellent colleague, Anthony Vallisneri, and being asked by him two things, the one, that I would tell him what my opinion was of the disease, and the other, that I would be present with him at the dissection of the body, I immediately promis'd him the latter; but in regard to the former, I only answer'd at that time by saying, it happen'd to me, more than once, after many and even very violent symptoms, that I did not find an aneurism in the great artery, but only some disorders of the internal surface of it.

The body was still warm many hours after death, notwithstanding the weather was colder than was usual in that season of the year; for it was the twentieth of March, in the year of our Lord 1726; externally it had a laudable

dable appearance; but the neck was rather thickish, and the belly somewhat turgid; yet not so that there appear'd any mark in the skin, of her having been four times pregnant.

Both the cavities of the thorax, but particularly the right, contain'd a considerable quantity of water, which had not the least disagreeable smell: the lungs were found, notwithstanding the lower surface of the left lobe, and also the posterior surface, in some measure, had adhesions to the neighbouring parts; the one to the diaphragm, and the other to the back: finally, in the aspera arteria, in the oesophagus, when open'd quite down to the stomach, in the mediastinum, pericardium, heart, auricles, and all the great vessels, when examin'd carefully both internally and externally, was no appearance of disorder, if you except, however, those appearances which I thought would be observ'd in the heart and great artery. For as I look'd upon this artery and the heart externally, and compar'd them one with another, and with the other parts of the body, the artery seem'd to be somewhat more contracted than it ought to be, and the heart more enlarg'd; yet neither in a very great degree. The heart being soon after dissected, and two very small polypous concretions, one of which was at the valvula tricuspidis, and the other at the beginning of the aorta, being taken away, together with the blood, which in the ventricles of the heart was scarcely less fluid than in the rest of the body, I observ'd that the corpuscles in the middle of the border of the valves, plac'd at the beginning of the arteries, were harder, and at the same time larger, than they usually are, and particularly one. However, these appearances were of no great consequence. But those which were found in the aorta, although at first sight they might seem to be slight also, yet when the whole trunk of it was open'd longitudinally, not only in the thoracic portion, but in the abdominal also, soon after they were known to be of great importance. For the whole internal surface of this vessel, quite from the heart to that part of it which lies below the orifices of the emulgent arteries, if you compar'd it with the other part, that goes to the division of this artery into the iliacs, manifestly inclin'd, from the natural whiteness and smoothness which was in this lower part, to a yellowness of colour and inequality of surface; and this inequality, if you look'd attentively upon it, seem'd to be owing to these circumstances of the artery, that in some places it was rais'd up into little protuberances, and in other places subsided into very small sinusses. But all this was upon the surface; except that a little above the valves, there was a small narrow space, where the surface being somewhat hollow'd out, as it were, by erosion, shew'd the fibres which lay under it in a divided state: and in the neighbourhood of the emulgent arteries, the internal lamella of the artery was very easily rubb'd off, by applying the nail to it slightly. However, there was no induration in any part of the aorta. But the appearance of disease, which I have describ'd as subsisting through so great an extent of it, was at least produc'd into some of its upper branches, as I observ'd by looking in upon their orifices from the curvature of the aorta.

In the belly was water, and not in very small quantity. The omentum was contracted, and extremely lax, but a small quantity of fat being left here and there. The stomach was very large, and full of a fluid. The liver was

pale,

pale, and the gall-bladder contain'd but a little quantity of discolour'd bile. The spleen was hard, yet not large. The parietes of the uterus also, though in other respects sound, were very hard and thick. The ovaria were hard likewise, externally white, and not small; internally were cellules, some of which were empty; and in one of them the parietes were yellowish, while others were fill'd with a bloody kind of fluid. The other parts were in their natural state. The head was not dissected. I have already told you that the neck was somewhat thick, which was owing to the thickness of the thyroid gland, that was much larger than when in a natural state. When it was cut into, it seem'd to be made up as it were of small lobes, in the middle of which was found a globule full of fluid, which was very much like the oil that is press'd out from almonds. There was a great quantity of blood in this carcase; and it was every where fluid, as I have said, except those very small concretions in the heart.

5. In regard to a woman of an irascible disposition, who happen'd to have a just cause of anger and sadness, and who had lost her appetite for food in a great measure, it is easy for you to conceive what kind of chyle would be prepar'd from the aliments she took in, and what kind of humours would be prepar'd from this chyle. Therefore, if together with that oleaginous liquor, by which Lancisi (*f*) thought that the internal surface of the arteries was preserv'd smooth and slippery, rough and heterogeneous particles insinuated themselves into the interior substance of the aorta, and were detain'd about the innermost coat; it will not be difficult to conceive how these particles were generated, or how they could bring about the change which I have mention'd in that part. But if you also enquire why they should be detain'd in that tract of the aorta particularly, and its superior branches, you may very properly account for it, from those affections of the mind which I have already spoken of, unless you should perhaps suspect, that this part was more weak and infirm than the others, from the first formation of the body. For the nerves being mov'd by these passions of the mind, act chiefly (as the sensations and appearances then sufficiently testify) I say, act chiefly on the larger vessels, and those that are nearest the heart; so that we must not wonder, if in that tract, in which the aorta is the largest, and in which this artery itself and its branches are at the least distance from the heart, the annular arterial fibres are then compell'd into very vehement or obstinate contractions, without any certain order or law, and by that means force out from the small vessels which lie betwixt themselves and the internal coat, even very gross and rough particles, if such there are, into passages where of themselves they would not have gone, and thus give occasion to their adhering there. And as those particles being driven here and there, may also bring on a sense of erosion, by reason of their asperity, beside that change of internal surface, it will be easy to understand from whence arose that troublesome kind of sensation, which the woman complain'd of at her spine; and in like manner that other, which extending itself particularly through her arms, increas'd the suspicion of an aneurism; whereas it certainly was from the artery not, however, being dilated, but in some measure eroded; which although it gives off branches that go

(*f*) De Aneurysm. l. 2. c. 1. Propos. 6.

throughout the whole body, yet it affected the arms most of all, to which it sent off branches that were themselves affected with the same disorder, or at least near to the trunk. Now then, if you attend to the internal surface of the aorta not being smooth, as if smear'd over with an oily kind of humour, but being made rough and unequal, as I have said, and for that reason still less slippery and soft, and consequently less yielding, not only to the circulating, but also to the distending blood, and the muscular coat, as being still less liable to give way, on account, I mean, of the fibres being more or less convuls'd, and frequently to such a degree, that even in the body after death, I found the trunk of the artery to be somewhat more contracted than usual; it will appear very clear, how much for all these reasons, and particularly for the last mention'd reason, the aorta would resist the blood; so that it would be necessary for the heart to contend with its utmost vehemence, in order to overcome these obstacles, and to thrust out the blood entirely from its cavities, which often, in some measure, stagnated in them: and from these considerations we gather the cause of the palpitation, and also the cause of the encreas'd magnitude of the heart. But as I have already (*g*) written to you on this last subject, I have no occasion now to say any thing more, either of its causes or effects, or of the observations relative thereto: it is sufficient to point out from among them those in which a palpitation of the heart was observ'd, as those which were made by Valsalva (*b*), by Meckel (*i*), by Schreyus (*k*): others of which kind I shall also mention below.

Thus you have the explication of the principal parts of the history propos'd, from whence you will be quite at liberty to admit whatever may be agreeable to your own opinion, and to neglect the remainder, and even to make a little more use of the convulsions of the nerves than I have done. For there are in this history such circumstances, as it seems quite impossible to explain without them; as, for instance, that paroxysm in which the muscles that raise up the lower jaw had so strongly contracted themselves, and that obstacle which prevented the aliments from descending into the stomach, after they had come very near it; which I suppose was owing to the muscular fibres of the diaphragm, through which the lower part of the œsophagus passes, being convuls'd. But now see whether the next observation does not also require that the nerves, or at least in some part, be suppos'd to have given rise to that disease.

6. A woman, who was sixty-four years of age, was troubl'd with a violent palpitation of the heart. At the same time a pulsation was seen in the vessels on both sides of the neck: and in the wrists the pulse was unequal, and somewhat obscure. Her respiration was difficult, and in the last days of her life extremely difficult, so that she could not now draw her breath, unless with her neck erect. Lately, also, an œdematous swelling of both hands had come on, but still more of the inferior limbs, join'd with an universal tumour of the belly. The woman was suppos'd to labour under a polypus or aneurism, or some other very great disorder of that kind, when she died in this hospital, about the middle of February, in the year 1741. But

(*g*) Epist. 17. & 18.

(*b*) Epist. 17. n. 21.

(*i*) Epist. 18. n. 4.

(*k*) Ibid. n. 15.

when, and from what causes, the disorder had begun, it was not possible to learn after her death; for she had come here a few weeks before from Venice.

I examin'd the body the day after her death, or at least not more than two days after. The swelling of the hands had gone down, but the tumour of the belly and the inferior limbs continu'd. Nothing was more easy than to disjoin the clavicles from the sternum, and to cut into the cartilages of the ribs; so that if the woman had not herself confess'd that age which I have mention'd above, she might have been suppos'd to be much younger. When the sternum was remov'd, the lungs appear'd turgid, and in like manner whitish; except that on the back part they were, as usual, of a saturated red. They were soft, and not annex'd to the parietes of the thorax in any part. There was in both cavities of the thorax no very small quantity of water, and also in the pericardium; but these fluids had not the least smell, though they were yellow in their colour. The ventricles of the heart and the auricles were distended with blood, which, although it had form'd itself into a coagula, had nothing at all polypous in it; and these cavities, even after they were become quite empty, seem'd to be bigger than they naturally are; which I particularly observ'd in the left auricle. The pulmonary artery and aorta were more capacious than was natural; and all the valves enlarg'd. But almost all these circumstances I have mention'd, were of a just proportion with each other; and if you compar'd the heart and its parts, and the above mention'd arteries, with the other parts of the body, you then perceiv'd that the magnitude of them was increas'd; yet not to a very considerable degree. This being the state of things, and there being, as I have said, no very great quantity of water in the thorax or pericardium, and as the lungs appear'd to be sound, I began very diligently to examine, internally, not only the heart and those arteries, but also other vessels, both without and within the lungs. But in the heart I could observe nothing, besides what I observ'd before; except that in the larger valvula mitralis, on that surface which look'd towards the other, there was a small semilunar orifice, through which the probe ascend'd, betwixt the membranes of the valve, to the extent of about a line longitudinally: and there was also a thickness and hardness, particularly in the borders of one, and of the other of the valves of the great artery. But this artery, being open'd longitudinally, from the heart, quite down to the diaphragm, I saw first, that in this whole tract, some obscure lines as it were seem'd to be drawn every where, according to the length of the vessel; and particularly from the heart to the curvature, about which, in one place, a whitish kind of spot also was seen: in the next place, I observ'd that the internal coat being taken hold of by the nails, wherever you would, or even push'd against by them, might be drawn very easily asunder, and into pieces that were not very small. Then having dissected the trunk of the pulmonary artery, and some of its branches, I found in several of them blood that had form'd itself into a kind of tubuli in some places. This blood also had a polypous substance adhering to it, and was itself of a certain degenerated colour; whereas nothing of this substance was seen in the heart, as I have said, nor in any other part; but the blood was every where extremely black.

As in the branches of the pulmonary artery, when cut into in like manner; and the vena cava itself, which had been before open'd, nothing appear'd worthy of remark, the bronchia were laid open; and in these tubes was a frothy humour, which although it might seem in some places to be purulent, and in others to be bloody, yet was in fact not at all purulent. The section then being carried on, from the bronchia through the trunk of the aspera arteria, quite to the larynx, and the œsophagus being open'd in the same manner, and all these parts and the pharynx being closely examin'd, not the least tincture of blood appear'd any where; so that it was uncertain by what means blood had come into the mouth of the carcase.

The belly, in which I did not doubt but there was water, there was neither time nor occasion for opening; for this cavity had not been affected with a swelling till the last days of her illness; nor were any complaints ever heard from the woman of the abdomen; nor yet of the head. And the brain, indeed, when I dissected it the day following, for the sake of public demonstration, offer'd nothing worthy of observation, unless that a larger quantity of blood than usual flow'd out of its vessels.

7. If out of the appearances I observ'd in this body, you set aside all those, which, although they might encrease the violence of the disease, yet did not give rise to the disease itself, but rather were the consequences of this disease, as effects are the consequences of their causes; you must then, of course, come back to a few things, which may be consider'd as the proximate cause of the disorder; unless you suspect, indeed, that out of these very circumstances, some are equally to be look'd upon as effects, and others as being, perhaps, of too little importance, to be consider'd as having it in their power to excite such a disease. For I should be inclin'd to believe either of these suspicions, in regard to that blood which I describ'd in some of the branches of the pulmonary artery: and if you should chuse rather to suppose, that it had not stagnated there in the latter part of life, but long before, and that, by this means, it had laid that obstacle to the remaining blood, which was about to enter behind, from whence the dilatation of that artery, and of the right ventricle of the heart, and its neighbouring auricle, is to be accounted for; though I could, indeed, make other objections, I will, however, only ask this one question, From what cause, then, will you deduce the dilatation of the aorta, and the left ventricle, and auricle, and the delay of the blood, by which they were thus distended?

But as to what was observ'd in the valves, one of the appearances does not, perhaps, relate to any disease; as that orifice in one of the valvulæ mitrales, which led into a small interstice of the membranes, whereof it was compos'd. For I have, more than once, seen this kind of small disjunctions of one membrane from the other, in the valves of the heart, without any other mark of disorder being there, and suppos'd it to have exist'd from the very birth. So, particularly in one of the valves of the aorta, I observ'd the membranous laminæ to be so disjoin'd, that they admitted a probe betwixt them. But because, as I shall tell you hereafter (1), the heart belong'd to a man who had labour'd under an aneurism at the curvature of the

(1) Epist 58. n. 13.

aorta, if you should, perhaps, choose to consider both the one and the other disjunction as owing to the violent impetus of the blood, in its circulation; then this will also be an effect, and not a cause of the disease; as in like manner those appearances will be, which were seen on the internal surface of the great artery. And as to the thickness and hardness of the edges, which I remark'd in the two valves of the same artery, if they are not the effects of the disease also, yet they have, at least, been so often found by me in those persons who had suffer'd no disorder, of any consequence, about the heart, that they by no means seem admissible, as causes of those symptoms with which this woman was so violently affected, as I have already related in her history. Some indication of which, these dilatations in the cavities of the heart and the annex'd arteries afforded: dilatations that were, in other respects, inconsiderable, and nearly correspondent with each other: yet their state was such as still to leave it undetermin'd from whence they had their origin. And if this origin be accounted for from convulsions, it will not be contrary to all probability, and will even be accommodated to the better understanding of the disorder. But now let us join to the three women already spoken of, a fourth, in whom not so much a palpitation although this was not wanting, as a troublesome sense at the heart, will require an explanation from us.

8. A woman, a little younger than that last describ'd, complain'd, in the same hospital, of a palpitation of the heart sometimes, but always of a difficulty in her breath, which she could not draw but with her neck erect; and still more of so great a straightness and anxiety at her heart, that very often she seem'd just at the point of death. Some suppos'd her to labour under a dropsey of the pericardium. Her pulse never was intermitting; but her veins were large. She died at the time that the genital parts of a woman were wanted to finish the public demonstrations of the year 1731, a little before the middle of March.

The thorax and belly being open'd, some quantity of water was found in both cavities; but there was no dropsey of the pericardium. The valves of the aorta were indurated, and one of them even bony. The trunk of the artery itself shew'd, up and down on its internal surface, either something bony, or something verging to the nature of a bone; so that the part of the artery which went through the belly, and which I dissected after demonstration of the genital parts, was in the same state. Nor did I find it bony only at the side of the inferior mesenteric artery, and in other places, but even at the very division of it into the iliaes: and in several places it was unequal, and here and there of a whitish colour, as it generally is when it begins to become bony.

9. It certainly cannot be denied, that the aorta, in the state I have describ'd it, must resist the blood, as it is driven by the heart, and, for that reason, be able to create a palpitation, a difficulty of breathing, and that sense of straightness with which the woman was tormented. But at the same time it is necessary to declare, why, out of so great a number of persons in whom there was an aorta of this kind, as I have already written to you, and shall write hereafter, many of them, certainly, did not labour under these disorders at all, or, at least, not so vehemently. And in order to do
this,

this, other circumstances, without doubt, must be added to the disorder of the aorta, which did exist in this woman, and did not exist in the others; as, for instance, a different fault in the organs, or a different constitution of the blood, different quantity, and other things of a similar kind besides, that we may not seem to be always bringing in the more exquisite sense of the nerves, and convulsions. So in an observation of Verducius, already pointed out (*m*), after a violent palpitation of the heart, and a very great asthma, the aorta was found to be internally bony near the heart; but the heart itself was found to be of a stupendous magnitude, hard, and tumid. So in another person, who having been long afflicted with various disorders, had been, in the beginning of them, very much subject to a palpitation of the heart, the celebrated Plancus (*n*) not only found the aorta in many places become bony, but also both the coronaries of the heart, and the heart itself very large, particularly its right auricle, which was the largest and strongest of all: and from hence you may easily perceive, that, in consequence of this one disorder, the heart might be more vehemently irritated by the blood being more strongly impell'd into the subjected ventricle; and may the less wonder, if in the observation of Grassius the younger, spoken of already in this work (*o*), it shall perhaps appear, that nothing else could be the cause of the palpitation, but the right auricle being enlarg'd to the double of its usual capacity. Finally, not to detain you too long, in a woman of an illustrious family, whose palpitation of the heart was so great, and so constant, as to be heard by those who stood near her, and be discern'd by those who were at some distance, the celebrated Cohausen (*p*) not only saw the aorta entirely callous; but he even saw in the heart itself, not to mention the lungs, scirrhi, and the blood viscid. and mucous.

Wherefore, in the woman, also, spoken of by me, besides the aorta being here and there bony, or inclining to a bony state, the valves of it are also to be attended to. For as one of these was bony, and the others indurated, so being, of consequence, less yielding to the blood, they might encrease the obstacles to its exit, and, on the other hand, not sufficiently prevent its return, when, soon after, repuls'd by the contraction of the great artery; so that, as some portion of it return'd into the left ventricle of the heart, when this ventricle ought to receive the blood that was coming in from the lungs, it would necessarily happen, that the returning portion, as well as the portion which had not been extruded just before, must occupy some part of that space, which, from the design of nature, was entirely due to the blood that was coming in from the lungs. Which circumstance, finally, could not but overload both the lungs and the heart, and compel the latter to throw out, every now and then, with a great impetus, the blood that stagnated in it.

And these things, which reason seems to lead us to, are confirm'd by more than one observation of the anatomists. Thus Vieussens (*q*), in a man and a matron, both of whom had been long troubl'd with a palpitation of the heart, and incapacity of lying down with the head low, join'd with an in-

(*m*) Epist. 18. n. 4.

(*n*) Epist. de Monstr.

(*o*) Epist. 18. n. 4.

(*p*) Commenc. Litter. A. 1743; Hebd. 21.

n. 4.

(*q*) Traité du Cœur, ch. 16.

quality of the pulse, relates, that the aorta and its valves were found to be bony in the matron; and, in the man, that the aorta was very hard, and in a manner cartilaginous; and the valves not only bony, but also with their edges cloven asunder, and the same really become stony; I say really, lest you should, perhaps, imagine, that what was bony should have been taken for being stony in the heart, as it has happen'd sometimes in other places. For besides those which will be mention'd below, you will read of similar cases, here, in the Sepulchretum, in observations which are pretty ancient; as that of Gregorius Horstius the elder (*r*), who found "a calculus concreted from tartar adhering to the membranous substance of the valves" of the right ventricle of the heart; and that of Jo. Georgius Greifselius (*s*), who saw one of those valves of the aorta which we are speaking of "half-consum'd, and lost, and that part where it adher'd to the artery even friable into a kind of sand;" and there was "a kind of white particle, like the nail of a little finger," which was the part of the valve that the blood had lately torn away; the heart being in both of them, who died after a palpitation, very much enlarg'd, in the same manner as the left ventricle had been in that man of Vieussens.

You will not wonder, therefore, at the assertion of Vieussens, that the borders of the femilunar valves had been found by him to be in a stony state. You will rather wonder, that he, once and again, denied his having ever heard, or read, that there had been found any variation from the natural structure of these valves by anatomists, when even that observation of Greifselius, which is publish'd by Bonetus, being taken no notice of, there were not wanting other observations of the valves of the aorta being bony, in books that are commonly known; as that which Raygerus has given in the *Miscellanea Naturæ Curiosorum* (*t*); and that which Ruyfch has set forth in his *Observationes Anatomico-Chirurgicæ* (*u*), although with the addition of a figure (*x*) by no means worthy of him. After these follow'd six observations of Cowper, and other Englishmen, which, to pass over others, describe these very valves (*y*) as being bony, either in the part where they form'd an excrescence, or altogether so, or as being become stony, or gypseous; or, in fine, so dense, contracted, and white, that it seem'd as if they must have soon grown into a bony, or a stony nature. To which observations you may at least add three or four others of very eminent men, Theodorus Zwinger (*z*), Josephus Exup. Bertinus (*a*), and Albertus Haller (*b*); who found the same valves, the first, in an old man, to be very hard and cartilaginous in the part by which they coher'd to the aorta; the second, in two virgins, to be hard and bony, and so dispos'd, that a common goose-quill would hardly pass between them; and the third, in a young man, found a fabulous matter betwixt their membranes, and bony scales in their tendons, so as to render them rigid, and not capable of giving way to the force of dilatation.

(*r*) Obs. 35.

(*s*) Obs. 13.

(*z*) Act. N. C. Tom. 1. Obs. 78.

(*t*) Dec. 1. A. 3. Obs. 282.

(*a*) Quæst. Med. an causa mot. altern. cord. multipl. n. 3.

(*u*) Obs. 69.

(*x*) Fig. 57.

(*b*) Opusc. Patholog. Obs. 52.

(*y*) Saggio delle Trasfraz. tradotte dal Derham, Tom. 2. P. 2. c. 3. § 7, 8, 9, 13, & Fig. Tab. 5.

10. But do not imagine, that in all these observations the palpitation of the heart is mention'd; for out of the four last, you will read of it only in the last of all, and will be in doubt to which disorder, in particular, among so many very considerable disorders, that will be mention'd below (*c*), this symptom was to be ascrib'd: as you would also doubt, in regard to the first, whether a palpitation had preceded; for the pulmonary artery was somewhat cartilaginous, and the heart bigger than it naturally is, as I have hinted already (*d*); but a long-continu'd asthma had preceded, and a dropfy of the thorax: as in the two of Bertinus, anxieties, faintings, and inequalities of the pulse of all kinds had preceded. In like manner the last of those six histories of the English (*e*) mentions palpitation, but in such a manner only as to account for it from the universal and close adhesion of the pericardium to the heart; which is a circumstance that we shall consider hereafter (*f*); at least this adhesion and other præternatural appearances were not wanting, as, in particular, a great dilatation of the left cavities of the heart. But the fourth and the fifth mention nothing besides a dropfy, and an asthma: the others speak of intermitting pulses; and the second of a very short respiration, besides an uneasiness in lying down, a kind of troublesome sensation at the heart, and swoonings; so that it is natural to suppose a palpitation, if there had been any, would not have been omitted. Nor has Ruysch (*g*) mention'd any thing of this, though he did not only not omit the asphuxia, and lypothymia, which attended the latter days of the disorder, but even not the asthma, which had been of a long continuance before: whether designedly, or from forgetfulness, he will perhaps determine, who gives more credit to Blancardus than to him; for this is that dissection, at which he has, with his usual dissingenuousness, signified, that Ruysch was only present as a spectator, as has been already said in the beginning (*h*).

But if we believe Blancard, that a palpitation was, sometimes, not wanting, we must of course also believe, that the heart was twice as big as is usual: the dilatation of the left ventricle of which, together with other things that were præternatural, is propos'd in the greater part of those observations of the English, which I just now commended. That observation indeed, which Raygerus had before publish'd (*i*), seems to lie open to exceptions of this kind the least of all, as he says, "that in the whole body nothing morbid or præternatural was found, except that the three femilunar valves, situated at the entrance of the great artery, from the right ventricle of the heart, were bony." Yet if you accurately consider all the things which are hinted in regard to that man, you will perhaps think that he had been subject to no complaint, till he was taken off by a sudden death, whatever the cause of this might be.

But as those exceptions, which are drawn from other injuries of parts, being join'd together, may have more room in the place where the enquiry is made, what was the cause of the palpitation, than where it is enquir'd, why it did not exist; and as I preserve the exceptions which I have pointed

(*c*) n. 12.(*d*) Epist. 18. n. 4.(*e*) c. 3. cit. § 13.(*f*) n. 17. & seqq.(*g*) cit. supra, ad n. 9.(*h*) n. 1.(*i*) supra n. 9.

out now and then, for that place, where I shall treat of the disorders of the pulse, which were present at the same time (*k*); I shall here make use of those observations, in which, though the valves of the aorta were rigid and inflexible, yet no palpitation is taken notice of: which it does not seem probable could have happen'd from carelessness or forgetfulness, especially as this has certainly not happen'd to me; as by reading over again some of those histories that I have sent you before, you will easily perceive. For you will see, that in the shoemaker (*l*), those valves were somewhat rigid, hardish, and contracted into themselves; yet amongst all the other disorders of which he complain'd, I never heard any thing of a palpitation at the heart. And, to omit a certain old woman (*m*), who, although she had the aorta, and one of its valves, so constituted, nearly, as that woman (*n*) had, who gave occasion to my entering upon this disquisition, yet was by no means troubl'd with the same disorders; I have describ'd to you two old men (*o*), in enquiring into whose complaints very accurately, I heard nothing at all of palpitations of the heart; but the pulse, I was certainly inform'd, as in the shoemaker likewise, (for in regard to the old woman, I do not clearly remember) did not intermit; I mean at the times when they ought to be particularly attended to, that is, when there were no faintings, nor any considerable fever: and, notwithstanding all this, the great artery in both of the old men was internally beset with bony laminæ, and, in one of them, had the valves here and there hard; in the other, already perfectly bony, and inflexible; and the same protuberating inwards, in their body, which was distant from the parietes of the orifice; the corpuscles also, which are in the middle of their borders, being bony, and encreas'd in their bulk: the valvulæ mitrales were somewhat thicken'd likewise in the latter; but in the former, they were here and there hard, in the same manner as the semilunar valves. But I have other observations also, besides those, which are not of a dissimilar nature, as these that immediately follow.

11. A decrepid old woman, having gangrenes, that remain'd after an acute disease, was at length brought down to the most emaciated state of body, and to death. From the very time she had escap'd that first disease, her pulse had been small and weak, yet not quick on the first days; though afterwards, when she was thirsty, they became quick, but never intermittent nor unequal. She had no palpitation of the heart, no difficulty of breathing; for all these circumstances I particularly enquir'd into, from the physician who had visited her every day: and I enquir'd, after having examin'd the heart of this old woman, in the college, about the end of January, in the year 1739. After having answer'd what I have just related to you, he added, that she had complain'd only of her stomach; by which term we suppos'd her to have meant the præcordia, as most of the common people do; especially as she had an appetite for food, and took down what was offer'd her; nor did the dissection give us reason to suppose otherwise.

For when the belly was open'd, every thing was found except the uterus; as the stomach was also, though contracted into itself. But the uterus had

(*k*) Epist. 24. n. 21.

(*l*) Epist. 18. n. 2.

(*m*) Epist. 19. n. 49.

(*n*) supra n. 8.

(*o*) Epist. 7. n. 9. & Epist. 21. n. 15.

its fundus almost universally black, on its internal surface; or at least of a brownish colour, as parts affected with a gangrene generally are; and the same was unequal, particularly in one place, where the surface rais'd itself up into a small and low excrescence. The tubes of it were altogether impervious to about the middle of their length.

In the thorax, besides white spots of the aorta internally, and some long scales, this was particularly to be remark'd, that I found the valves of the same artery contracted, hard, and bony, and at the edge thereof thickening, as it were, into pretty large tubercles.

12. It appears therefore, from the observations of others, and from my own, that a palpitation of the heart, contrary to what generally happens, does not always follow where the valves of the great artery are rigid and bony: and the same thing appears in regard to the intermission and inequality of the pulse. The disorders of which, although they belong to the next letter, I here nevertheless touch upon now and then, with one and the same trouble, as they were, or were not, join'd with the disorders of those valves, that there may not be occasion to repeat the same observations in that letter, but it may be sufficient to point them out. And this method it is my intention to pursue, in the examination of the greater part of those causes of palpitation which I see advanc'd.

And amongst these, that first offers itself to our consideration, which consists in some disorder of the neighbouring mitral valves. Thus Vieussens (*p*) ascribes a most vehement palpitation of the heart, attended with a very low, weak, and altogether unequal pulse, to the contraction that he found of these valves, and their change into bone; which, in consequence of the orifice whereat they are plac'd, being thus diminish'd, not admitting any great quantity of blood, and (as you yourself will add) not being able, altogether, to prevent the return of that which they had admitted, compell'd the greatest part of the blood to remain behind in the vessels of the lungs, and in the right cavities of the heart, which it had dilated. So the celebrated Reimannus (*q*), having observ'd the same symptoms which I just now spoke of in a patient, found "the valves of the vena cava called mitrales," which name, besides other things, shews that he meant to say "the pulmonary vein" instead of the vena cava, "and one, in particular, of them, with its fasci-
"culi and carneæ columnæ, which are prominent at the sides of the ven-
"tricle, rough, and entirely ossified." So the very experienc'd Morand (*r*), in a man who had been subject to palpitations of the heart, found one of these valves dilated into a sacculus big enough to admit a man's thumb; I suppose, because the quantity, or the impetus of the blood had, by degrees, enlarg'd the interstice of the same kind with that which, as I said above (*s*), I observ'd to be form'd by an orifice opening betwixt the membranes of the valves; the parietes of which sacculus were not only much thicken'd, but beset here and there with little bones. Yet the valves of the aorta were also thicken'd, and furnish'd with small bones of a considerable hardness; and Reimannus, besides the columnæ carneæ being ossified, as is already said,

(*p*) *Traite du Coeur*, ch. 16.

(*q*) *Ag. N. C. Tom. 1. Obs.* 170.

(*r*) *Hist. de l'Acad. des Sc. A. 1729. Obs.*

Anat. 7.

(*s*) *n.* 6.

had seen that artery much contracted by stony concretions adhering to it internally, and a droply of the pericardium at the same time: and Vieussens had found both the thorax and the lungs full of serum, and all the great vessels, except the aorta, dilated. So, also, the most excellent Haller (*t*), after an hereditary palpitation of the heart, found the valvulæ mitrales to be universally very hard and solid, and so full of calculous matter, that it grated against the knife, as the fibres were cut into in different places: he also found the flesh of the neighbouring pulmonary sinus to be stony, and a part of the heart itself to be half stony, and the pericardium to be here and there beset with scirrhi, and grown to the heart; to pass over other circumstances in the same body, and amongst these, what I before related of the valves of the aorta being rigid, and undilatable; and still more what he saw in a certain old woman (*u*), not only in one of the same valves, but also in the neighbouring aorta and the pulmonary artery, and even in the heart itself, and the coronary arteries thereof; inasmuch as these diseases were more considerable than that which was in one of the mitral valves, but especially because there is no certainty with what disorders the woman had been afflicted.

13. But we must also add, in this place, the observations of those who, when they found the valvulæ mitrales bony or rigid, and unequal to their offices, amongst other symptoms which had afflicted the patients when living, said not a word of palpitation of the heart. For Rayerus, although he speaks in more than one work (*x*) of that virgin, who was diseased by Glaserus his præceptor, in whom he saw them chang'd "entirely into a bony substance, and shutting up the orifice," makes no mention of any other disorder, in any place, than a sudden droply in a person who was in good health, a difficulty of breathing, and an unexpected suffocation: and indeed Mangoltius (*y*), who wrote to Bonetus of the same virgin, says still less of her disorders. Nor does Bellini (*z*) say, that a stone generated in one of the valvulæ mitrales had produc'd any other disease but "a very various intermission of the pulse, the patient being afflicted at the same time with very surprizing pains." Nor have you seen that Cowper, from whom are four of the six English observations spoken of above (*a*); although he relates, or represents by figures, that the same valves were also in part stony; nor have you seen, I say, that he mentions any thing of palpitation. But if you should contend that this might be omitted by mere accident, or in consequence of these writers, who were in other respects very diligent, being employ'd upon some other pursuit or enquiry, I will not obstinately contest the point with you. Nor will I judge otherwise, if you would have it so, of Hunauld (*b*), who mentions nothing but a consumption in the case of that woman, whose mitral valves he found beginning here and there to be ossified, and so glued together, one with another, that, the passage of the blood into the ventricle being streighten'd, the left auricle was consequently enlarg'd. Yet I will beg of you to read the observation of the celebrated Fan-

(*t*) Obs. cit. supra, n. 9. & 10.

(*u*) Obs. 51.

(*x*) Meth. Hist. Anat. c. 6. in Schol. & Pæon. & Pythag. Exerc. 24.

(*y*) Sepulchr. l. 3. S. 19. Obs. 3. § 6.

(*z*) De Morb. Pect. 1.

(*a*) n. 9. & 10.

(*b*) Hist. de l'Acad. R. des Sc. A. 1735. Obs. Anat. 6.

tonus (*c*), who found the valvulæ mitrales “ of an unusual hardness and thickness; and in one of them saw two follicles, and in the other one, each being nearly about the bigness of a vetch, from which, when open’d, a yellowish, and almost greenish, matter flow’d out;” and these things he testifies that he saw in a certain old man, in whom, “ although he himself said that he had long been troubl’d with a slow fever, and a weakness of the stomach, no signs of the heart being affected ever had appear’d.” And if you read over again the letters I have sent to you, you will find a husbandman (*), in whom I saw “ an excrescence,” of a cineritious colour, growing upon the same valves, which was, as Lancisi (*d*) observes, a very rare disease indeed, even in the other valves of the heart: and yet amongst other things with which the patient was affected, was there not any palpitation of the heart, or inequality of the pulse; although the latter, perhaps, would not have been wanting, if the pulse had been less vehement and quick.

You will also find the history of an engraver (*e*), and a porter (*f*), who, till they were seiz’d with a sudden apoplexy, and both instantly carried off, had not been subject even to the slightest disease; in the former of whom one of the mitral valves was chang’d in its colour, and in its nature, and became much harder than it ought naturally to be; and in the latter, some, both of the mitrales and tricuspidæ, protuberated at their edges into a kind of glands, made up of a dense and firm substance. But, to be brief, I will not mention over again, here, those two old men, of whom I spoke above (*g*), when the question was of the semilunar valves, in one of whom the mitrales also were thicken’d, and in the other, in several places, hard: and I shall omit many others, in whom I found their edges to be hard and tuberos, which circumstance renders them somewhat less fit for their office, whether it be from any peculiar disease, or only the mere consequence of old age; for I have even seen the same circumstance in an old dog; and it is both in these valves and the tricuspidæ, in which I have in like manner frequently seen it, a kind of step, as the celebrated Haller also imagines (*h*), to the taking on a bony nature. But those which I have found already become bony, I must defer the consideration of to another time, on account of the very violent disorders with which they were join’d.

14. But in the mean while, as you see, that though a disorder of the mitral valves is suppos’d, and that not a slight one neither, sometimes a palpitation of the heart, or an intermission of the pulse, does not immediately follow; so, also, I would have you believe, that whatever other obstacle, that is even nearer to the right cavities of the heart than these valves are, may have dilated them, by confining the blood therein, a palpitation may not immediately be the consequence; for in the eighteenth letter (*i*) it is hinted, that an inequality of the pulse is but little likely to happen in that case. But I remember, you will say, that in this very place it is acknowledg’d and confirm’d by you, that a palpitation generally troubles patients at such a time. And you remember

(*c*) De Obs. Med. Epist. 8. n. 20.

(*) Epist. 11. n. 11.

(*d*) De Subit. Mort. l. 2. § 7. & 8. Schol.
ad Obs. Phys. Med. 4.

(*e*) Epist. 3. n. 26.

(*f*) Ibid. n. 4.

(*g*) N. 10. in fin.

(*h*) Ad Boerh. Prælect. § 149.

(*i*) N. 11.

rightly; for I did indeed acknowledge, that there was “often” a palpitation at such a time. But do I deny it now? So far from this, that I shall even confirm it, by adding other observations over and above. Let it be sufficient, at present, to have pointed out that of the celebrated Chomel (*k*), who remark’d, that a man, whose pulmonary artery was internally and externally beset with stony tubercles, and whose heart was very much enlarg’d, had been troubl’d with frequent palpitations. For I certainly would not deny, that any one of the causes of palpitation which have been propos’d, has been sometimes join’d with it; but I will confess, that some have more frequently been join’d to it than others. I only admonish you of this one thing, that where any cause of that kind is suppos’d, we must not immediately recur to this second supposition, that a palpitation of the heart was necessarily, and invariably, attendant upon it. For I would have you, by way of example, turn to the dissection of that virgin (*l*), in whom Valsalva found the valves that are plac’d at the entrance of the pulmonary artery, tied together one with another, so as scarcely to leave a passage for the blood equal to the diameter of a lentil, which, for this reason, stagnating in the right cavities of the heart, had dilated them. Yet you will not find any thing remark’d of a palpitation, among the other symptoms which had afflicted the patient when living. But if you chance to light on any histories, from which the course of the blood being retarded through the lungs, that were internally and externally compress’d, may seem to have given rise to palpitations of the heart; such as, amongst other observations, is that of the celebrated Grimmus (*m*), in which he speaks of a man who had been troubl’d, perpetually, for more than a year, with this complaint, and whose lungs, on one side, were surrounded with extravasated water, and both of the lobes internally beset with almost innumerable vomicae; I would give you free leave to suppose, that the palpitation had had its origin from hence: yet, at the same time, I would have you remember, that this symptom was seldom or never observ’d among that great number of persons whom I have spoken of in the former letters, as dying of a dropy of the thorax, or a hardness of the lungs, as in a peripneumony, or of tubercles, as in a consumption.

15. It would take up too much time to go through all the causes of palpitation that have ever been propos’d, especially as I am not willing to repeat what has been already said, or give at present what must be said hereafter. For as to ossifications of the heart itself, ulcers, or polypi, there will be a better occasion to speak of these in the next letters.

And in regard to the dropy of the pericardium, from which there are so many who account for palpitation of the heart, it is to no purpose to add any thing to what has been already said, in the sixteenth letter (*n*), of that former disorder being sometimes join’d to the latter, and sometimes not.

It will be better, therefore, to consider, in this place, some other affections of the pericardium, which have been produc’d in the number of the causes of palpitation; and one in particular, which I have more than once seen in the bodies of patients after death. For flatuluses shut up within this cavity,

(*k*) Mem. de l’ Acad. R. des Sc. A. 1707.

(*l*) Epiit. 13. n. 12.

(*m*) Aët. N. C. Tom. 1. Obs. 111.

(*n*) Præsertim n. 23.

and much less worms, have never happen'd to occur to me. And, indeed, although many observations of palpitation or tremors of the heart are read in this section of the Sepulchretum (*o*), from worms of the pericardium; yet, in some places, I want a more certain testimony of worms being seen there, and in other places a more weighty one; I say, of worms being seen; for the names of great men are not wanting, even in the Sepulchretum, as of Franciscus Sylvius (*p*), Hartmann (*q*), Ballonius (*r*), Hollerius (*s*), Riolanus (*t*), and others, who, in agreement to the doctrine of some of the ancients, have suppos'd, without any doubt, that there were sometimes worms in the pericardium, and even in the heart itself. But if it be ask'd whether any one has seen them, Riolanus, indeed, says, "that Salius had treated of "this disease;" but where he had treated of this very thing, he by no means says. We must, therefore, return to observers. And the first of the observations pointed out (*u*) has a very great man, indeed, for its author: yet if you read it attentively, it is not an observation, but a conjecture. For he does not say that he had even once seen those worms, which, if, as he believ'd, they "very often" gnaw'd the heart, not only he, but others also, must have found within the pericardium. And if you ask who it was that saw the worm of the second observation (*x*), or in what prince, and at what time; the writer of the observation himself does not seem to have known these things. The third is from a manuscript of Stockerus (*y*), who, however, does not say that he had ever seen those worms.

And, finally (*z*), in regard to the last, that we may read it entirely, we are refer'd to the tenth section. But after having turn'd over the pages of this section, and having found that it is under the very first article of the eighth observation, we can neither understand it entirely, by reason of the carelessness of the printer; nor yet, on the score of his neglect, can we find it in that author from whom it is said to be taken, that is, from Zacutus, *lib. 2. prax. admir. cap. cx.* for it is in the first book, chapter cxxxix. And in this Zacutus says, that the worm was "dead, black, and of the shape of a "large fly;" as in the next chapter he describes "a little snake" in another heart. And as, from the very description of the latter of these, you will perceive that it was a polypous concretion, of the shape of a little snake; so you will easily suspect with me, that what he says resembl'd a great black fly, was a polypous concretion of the same kind, adhering to the internal paries of the ventricle of the heart, and particularly after you have examin'd other observations of this kind in other places (*a*). And yet I would not have you suppose me to say these things by way of obstinate contention, that it is impossible for a worm ever to exist within the membranes of the pericardium, as I have so often found them within the coats of the great artery in dogs (*b*). But I say them for this reason, because I would fain read more certain observations before I allow of it. And in the mean while, I shall say

(*o*) 19, & 25. § 1, 2, 3.

(*p*) In Schol. ad § 6. Obf. 21.

(*q*) Ad § 1. Obf. 25.

(*r*) Ad § 1. Obf. 27.

(*s*) Ad § 1. Obf. 7. Sect. 10.

(*t*) Ibid. § 3. (*u*) 19. Sect. hac 8.

(*x*) Ibid. Obf. 25. § 1.

(*y*) Ibid. § 2. (*z*) Ibid. § 3.

(*a*) Epist. 24. n. 23.

(*b*) Epist. Anat. 9. n. 45.

with Trallianus, who is commended under that very observation of Zacutus, that the worms which are troublesome to the heart, are those that injure the left orifice of the stomach, which draws the heart so into consent, that it is call'd *καρδια*; as was also the opinion of Sennertus, produc'd under the same observation where that fourth was produc'd. And in this manner are very easily understood those things that are remark'd, under the second and third observation, from Hartman, and Hollerius, in regard to worms being excreted in the palpitation of the heart which has its origin from worms: nor does it seem, that the method of cure of Lower, which is produc'd in the first observation, if it did really drive away the worms, is to be explain'd much otherwise.

16. But, although I equally well remember, as I have already said, that it has never yet happen'd to me, to find the pericardium distended with air, yet I shall the more readily give credit to Hollerius (c), a very grave man, who asserts, "that he had found it in dissected bodies, who died" of a palpitation of the heart; because I myself have found other cavities turgid with air, and the blood vessels also (d); and other authors, whom I have spoken of to you before (e), even the heart itself; so that if other circumstances permit you, you are at liberty for me to assent to those, who account for a palpitation of the heart from air distending, not only the pericardium, as here in the Sepulchretum, observation the eighteenth, but also the heart itself; yet this within those bounds which are hinted at by Franciscus Sylvius, in observation the twenty-first (f). And I have said, if other circumstances permit you, for some reasons, among which takes place that of the disengagement of air from the blood of living persons, not so easily to be suppos'd in the greater part of them, in which it would be, otherwise, very easily to explain a palpitation in this manner. And this it will be very easy for you to understand, from those things that have been disputed upon in the fifth letter (g). And how difficult that very supposition, which, as it is said in that letter (b), was advanc'd by Redi, I mean, that an intermission of the pulse was, for the most part, to be accounted for from some pretty large bubbles of air passing through the heart; I say, how difficult this supposition seem'd to his disciple Bellini, the writings of this author, which are publish'd (i), demonstrate. Wherefore, as I just now said of worms, so I now say of flatulencies, that these are for the most part troublesome to the heart, not by occupying the cavity of this viscus, or of the pericardium itself, but by occupying the intestines and stomach, that lie beneath them. Which viscera are often so distended with flatus, as to incommode very much the diaphragm, and the heart lying upon it. For on this supposition, what is inculcated frequently in the scholia added to that eighteenth observation, that by the eruption of flatus, a palpitation of the heart is frequently cur'd, or reliev'd, becomes evident and intelligible: which, if it occupied the cavities of the heart, or pericardium, as in that observation is suppos'd, could certainly find no passage through which it might burst forth suddenly and plentifully.

(c) De Morb. Iat. l. 1. c. 29. in Schol.

(d) Vid. ex. gr. Epist. 5. n. 19.

(e) Ibid. n. 20.

(f) §. 6.

(g) n. 25. & seqq.

(b) n. 21.

(i) De Morb. Pect. 1.

17. At length I come to that cause of palpitation, which evidently occurs, and not very seldom neither, and in which water, air, or any thing else, is so far from being interpos'd between the pericardium and heart, that the pericardium adheres to the heart in such a manner, that it may frequently seem to be wanting at such a time, unless you distinguish by an accurate enquiry; which leads the celebrated Haller (*k*), after Meyerus (*l*), Stalpart (*m*), Freind (*n*), and Lancisi (*o*), to doubt, whether those who have written that they had seen the human heart without a pericardium, were not deceiv'd in this way; among whom, besides those who are spoken of by the writers just now commended, is to be reckon'd Antonius M. Conanus, in the works of Hippolytus Boscus (*p*); and among the more modern authors, Alexander Littre (*q*), and Jo. George Hoyer (*r*). Yet Peyerus, after having explain'd his doubts upon this head in the following manner; "It is reasonable to suppose, that the pericardium had, in these cases, so adher'd and grown to the lungs, or rather to the heart itself, that they might not seem to be distinct;" left to more sagacious enquirers, a method by which they might explain the subject: and that method you will see plac'd in a very striking point of view, by the skill and industry of that celebrated man Kaav Boerhaave (*s*). However, the adhesion of the pericardium, not to the lungs, but to the heart, which he himself saw twice, from an unknown disease, and of which I am to speak at present; this adhesion, I say, whether you account for it from the defect of that water, or from glutinous and viscid particles being either secreted with it, or distilling from little ulcers, which are generated in the surface of the pericardium or heart, or both; you will always more easily conceive if any cause be added, which may press the pericardium closely to the heart, and the heart itself be suppos'd to have had for a long time a very languid and inconsiderable motion.

For I would have you take care how you understand otherwise, what Hermanus Boerhaave (*t*), using the same example as Peyerus (*u*), has said: "As the eye-lids, when they have been excoriated, sometimes grow together, by the rest of one night, so the lungs seem to grow to the pleura, and the heart to the pericardium." For neither the lungs nor the heart can be quite at rest so long; yet it is sufficient if they seem almost to be at rest. So also, where it is said by the same author (*x*), "The vapour which keeps the surfaces moist and disjoin'd, being deficient, it has been seen that the heart being grown to the pericardium, has, after miserable anxieties and palpitations, kill'd persons; a history of which kind is related by Peyerus;" there, I say, we must in like manner beware, lest we believe that this great man said more than he, perhaps, really meant. For Peyerus (*y*) has indeed remark'd "a very great anxiety of the chest," with a very difficult respira-

(*k*) Ad Prælect. Boerh. §. 132. not. *a*.

(*l*) Meth. Hist. Anat. c. 6. in Schol.

(*m*) Cent. 1. Obs. Med. Anat. 37. in Adnot.

(*n*) Hist. Medic. ubi de Avenzoare.

(*o*) De Mot. Cord. l. 1. Propos. 23. & in Schol. ad Hist.

(*p*) De Facult. Anat. Lect. 4.

(*q*) Hist. de l' Acad. R. des Sc. A. 1712. Obs. Anat. 1.

(*r*) Act. N. C. Tom. 5. Obs. 68.

(*s*) Nov. Comment. Imp. Sc. Acad. Petropol. Tom. 1. Obs. Anat. 4.

(*t*) Prælect. in Instit. §. 709.

(*u*) Schol. cit.

(*x*) Prælect. §. 182. (*y*) c. 6. cit.

tion, but has not expressly mention'd palpitations; although he has said, "that the pulse was always weak, and sometimes small and tremulous, in the two last months intermittent, and to the very last languid and creeping." Nor indeed is mention made of anxieties always, much less of palpitations, in all the observations which are pointed out under that passage of Boerhaave, nor in many others which occur to me as I write: and this you will perceive from those things that will be immediately, though slightly, hinted at upon each.

18. Four of the more ancient are in the Sepulchretum, but in different places; as that of Gul. Ballonius (*z*), Otho Heurnius (*a*), and that of the elder Phil. Sarazanus (*b*), who communicated to Hildanus (*c*) this adhesion of the pericardium to the heart, "which, as far as he knew, had been observ'd by nobody before him," in that year 1616, in which year Ballonius died (*d*), whose books indeed did not come out till nineteen years after. But Ballonius had known it in the year 1578. For amongst the annotations which he made in the spring of that year, you will read the following (*e*): "D. Duretus being sent for--- he supposes the cause of all the palpitation at the heart to consist in oppression, or in excussion. The former is, when the disorder is in the heart itself, or about the heart. As when too great a quantity of water has been secreted within the pericardium, or the pericardium adheres to the heart." This may seem to be known to Duretus himself. For indeed, when Ballonius enumerated that amongst the causes of palpitation, he neither hinted by whom, nor in what manner, it was observ'd. For these are his words (*f*); "The adhesion of the pericardium to the body of the heart itself, which has been observ'd in two hydropic patients." But be this as it will, these two observations, which are produc'd under the name of Ballonius, do particularly mention a palpitation of the heart. Yet this will be enquir'd after in vain in the observations of Sarazanus and Heurnius, as far as appears from the Sepulchretum. Both of them take notice of a difficult respiration; and Sarazanus, of other things besides, as in an affair that was quite new to him, which I see are confirm'd by Meckrenius (*g*) alone, perhaps by mere chance; but not a word of streightness or anxiety, pulses or palpitation. So also; to pass over to the more modern observators who have seen the pericardium adhering to the heart, and to take no notice of the observation of Meckrenius (*b*), by reason of the wound of the heart being join'd to it, in which, however, there is not one word of palpitation, or intermission of the pulse; Lower (*i*), although he has accurately put down what disorders had preceded, and amongst them, "a shortness of breath upon the slightest motion, a small and intermittent pulse, a troublesome pain about the præcordia, with a remarkable oppression, and frequent swoonings;" yet has not inserted the least mention of palpitation.

(*z*) Sect. hac 8. Obs. 20.

(*a*) Sect. 1. Obs. 74.

(*b*) Ibid. Obs. 94.

(*c*) Vid. Hildan. Cent. 4. Obs. 32.

(*d*) Vid. Ballon. Vitam.

(*e*) Epidem. l. 2.

(*f*) l. 1. Consil. Med. 109.

(*g*) Obs. Med. Chir. c. 35.

(*b*) Ibid.

(*i*) Tract. de Corde, c. 2.

And Peyerus (*k*), in regard to two dissections communicated to him by Weeper, says nothing else of those symptoms which had preceded, except that there had been, in one patient only, "an anxiety of the præcordia;" which patient "never was able to sleep, or even to breathe, unless in a prone "situation, supported on his knees and elbows." But Stalpart (*l*) does not say any thing even of that anxiety, but only mentions a continual and slow fever, and a cough, "by which was discharg'd a great quantity of blood." And Malpighi (*m*) does not give the least hint of the disorders with which Landinus had been afflicted. However, to return to the Sepulchretum, and to gather together here those things which may easily escape such as look for them, as they are dispers'd out of this section through many different sections; neither do Garnerus (*n*) nor Helvigius (*o*) mention any thing of the disorders which had preceded, besides an ulcerated breast and a dropsy, notwithstanding the adhering pericardium contain'd, either a heart very small, and contracted into itself, or encreas'd to twice its usual magnitude. Hiar-nius (*p*) does but just make slight mention "of some little inquietude at "the heart," and some other things which relate, in general, to a very great tumour of the belly, besides a difficulty of breathing. Stegmannus (*q*) has, indeed, many things in reference to obstinate and long disorders, which belong to this class, but says full as little of the injuries of the viscera; for relating a history of a palpitation of the heart, inequalities of the pulse, and a perpetual dyspœa, quite from childhood, he refers them to a kind of cartilaginous excrecence near the left auricle of the heart, to a quantity of fat covering the heart, so as not a little to encrease its bulk, and to other things, not only to the adhesion of the pericardium; and that very prudently, especially as this was made only by fibrous net-works, and those belonging to the fat which cover'd the middle region of the heart. But in all parts, and on all sides, was this adhesion observ'd by the physicians at Geneva (*r*), in a young man to whom a palpitation of the heart had been "famili-
ar;" as indeed almost all the others were, to which I make no excep-tions.

On the other hand, this palpitation was not observ'd by Hottinger (*s*), in a woman in whom he found the pericardium become very thick, like buff-leather, very hard, and fix'd closely to the heart, but only a shortness of breathing. Littré (*t*) had nothing at all to mention in two patients, for both of them died of wounds; the one of a wound in the thigh, whereas he said he was well in other respects; and the other of a wound in I know not what part, but within a quarter of an-hour; and this man, although that indeed is to be wonder'd at in both, does not seem to have been ill before. And indeed Ruyfch (*u*), where he shews the heart "to have been grown "into one substance with the pericardium, and that from an inflammation

(*k*) Schol. cit. supra, ad n. 17.

(*l*) Cent. 1. Obs. rar. 37.

(*m*) De Struët. Glandul.

(*n*) l. 4. S. 2. Obs. 7. § 1.

(*o*) l. 3. S. 21. Obs. 21. in Addit.

(*p*) S. ead. Obs. 36.

(*q*) l. 2. S. 1. Obs. 32. in Addit.

(*r*) l. 3. S. 10. Obs. 3. in Addit.

(*s*) Eph. N. C. Dec. 3. A. 10. Obs. 231.

(*t*) Hist. de l'Acad. R. des Sc. A. 1761. & 1766.

(*u*) Thef. Anat. 6. n. 36. not. 1.

" of these parts having preceded, from whence the patient was seiz'd with
 " an intolerable pain about the anterior parts of the breast, not without a
 " continual fever;" neither adds any other symptoms, nor does it sufficiently
 appear, whether he refers those that he does mention to that time of the
 inflammation, or to that which follow'd it, when the pericardium was already
 connect'd with the heart. But on the other hand, a violent and continual
 palpitation of the heart was observ'd by Dionis (*x*), besides other symptoms;
 and amongst these a difficulty of breathing, a vehemence and quickness of
 pulse. A very violent palpitation is, likewise, spoken of in the last of those
 fix English observations, of which we have spoken above (*y*). Yet that
 which is added to the fourth, and which is one of the celebrated Cheffeld-
 den's, mentions nothing but a dropfy, and a wasting of flesh. So also Lan-
 cisi, in neither of the two whom he describes (*z*), although he gave an ac-
 curate account of other things, and among those of contractions and oppres-
 sions of the præcordia, and faintings; in neither of them, I say, did he
 name palpitation; and in the first of them (*a*) has told us, that even the pulse
 was, "for the most part, equal." But a continual palpitation was observ'd
 by Vieussens (*b*), together with a slight oppression of the chest, which was
 also remark'd by Freind (*c*), "in a violent degree," at least, "near the end
 " of the disease, with a pulse always quick, and sometimes even unequal
 " and intermittent."

But Cantius (*d*), who wrote between both of these gentlemen, was en-
 tirely ignorant of the history of the man who was dissected by him, or of
 what disorder he died. And Abraham Vaterus, although in a kind of pre-
 latory discourse (*e*), where he gives us an observation that he took from the
 body of an old woman, he has omitted to mention the diseases that had pre-
 ceded; yet in his Osteogony (*f*) at length, speaking, as it seems, of the
 same old woman, he has mention'd nothing of palpitation, but a vehement
 asthma, a cachexy, an oedematous tumour of the feet, and an inflammation
 of the loins; nor yet was there any palpitation in the man (*g*), in whom,
 besides anxieties and oppressions of the heart, there was no complaint that
 corresponded with the concretion of this viscus to the pericardium, or de-
 pended upon it. Nor was there in the sailor, of whom the celebrated Lau-
 bius (*h*) gives the history, any symptoms besides a most violent asthma,
 which you could refer to the present question, although the pericardium, be-
 ing very firmly concreted with a very small heart, and with the diaphragm,
 was equal in hardness to a cartilage, and in thickness to a man's thumb; un-
 less a great quantity of serum, with which the belly and thorax were fill'd,
 and a number of vomiceæ, form'd upon the larger vessels of the lungs, and
 other things of that kind, could have been the occasion of it. In like man-
 ner the celebrated Daniel Hoffman (*i*), although he accurately describes so

(*x*) Descript. d'une oreille, du cœur.

(*y*) n. 9. & 10.

(*z*) De Subit. Mort. l. 2. Obs. Phys. Med.

4. & de Mot. Cord. Prop. 23.

(*a*) in Schol. ad cit. Obs. § 10.

(*b*) Traité du Cœur, ch. 1.

(*c*) ubi cit. supra, ad n. 17.

(*d*) Impet. Anat. Tab. 4.

(*e*) post Observ. rariss. calculor.

(*f*) Thesi. 20.

(*g*) Dissert. de calcul. in vesica fell. generat. Thesi. 9.

(*h*) Ast. N. C. Tom. 2. Obs. 20.

(*i*) Ibid. Obs. 2.

many disorders with which a girl, whose dissection he produces, had been afflicted, does not reckon palpitation in the number of them; and expressly remarks, that the pulse was never found to be "either unequal or inter-mittent."

But you will, without doubt, compare the observation of that very celebrated man Heister (*k*) with those of Littre, which were spoken of a little above; as it was taken from a young man, who was not only not a valetudinarian, but who was drinking "very freely in a tavern" with his companions, till he fell down suddenly from the bench on which he sat, as if he were drunk, and there died in a little time after. And although that learned man Jo. Guil. Agricola (*l*), when accurately describing the pericardium as being connected with almost the whole heart, after an inflammation of the thorax, (after which, not only Ruysch (*m*), but Hottinger (*n*), and even others, had seen it) takes notice of a very quick palpitation of the heart, even to the very end of life; yet he does not omit, that the magnitude of the heart was surprisngly increas'd, and that the auricles, ventricles, and vena cava, were unusually capacious, and the lungs full of tubercles. And indeed, although he saw the same concretion of the heart with the pericardium at three other times (*o*), and once where the lungs were without any taint, he, nevertheless, does not mention a word of palpitation; but only suspects, that, in some malignant fevers, the very great debility, faintings, and syncopes that attend them, are to be accounted for from thence.

Moreover, neither has the excellent Plancus (*p*), who oftentimes observ'd an adhesion of the pericardium to the heart, from a very violent blow on the sternum, mention'd any thing of a palpitation, in describing of this adhesion from the same cause, in a dropsical patient. And even if this adhesion had existed, it would, nevertheless, be doubtful, whether you should ascribe it to that cause, or to the bony ring with which the lower part of the left ventricle was surrounded; just as in the observation of Jo. Sebastian Albrechtus, which you have read lately (*q*), you will doubt, whether you should attribute the palpitation of the heart not without pain, and the periodical asthma, to corrupted lungs, and to a very considerable tumour, which grew, posteriorly, on the first division of the aspera arteria, and the magnitude of the heart, which was increas'd to twice its natural size, to which all the vessels that go out from, or come into it, and the right ventricle corresponded, but not the left ventricle, and the auricles; I say, whether you should attribute the palpitation to all these causes acting jointly, or rather to the sole connection of the pericardium with the flat surface of the heart in the greater part of it, and even to the very apex itself, by pretty strong and short fibres.

The celebrated Haller (*r*), also, saw a cohesion, "which, like a bridle, "constrain'd the extreme point of the heart, though it was not general;" but of what symptoms the man complain'd he has not added. And in ano-

(*k*) Obf. Med. Miscell. 4.

(*o*) Commenc. Litter. A. 1736. Hebd. 41.

(*l*) Commenc. Litter. A. 1735. Hebd. 8. in fine.

(*p*) Epist. de Monstr.

post n. 4.

(*m*) (*n*) Supra cit.

(*q*) Ag. N. C. Tom. 5. Obf. 21.

(*r*) Ad Praelect. Boerh. § 182. not. m.

ther who had been troubl'd with an hereditary palpitation, he saw the pericardium, in several places, connected to the heart, but by the means of scirrhi; and observ'd so many and so considerably diseas'd appearances, besides, in that same heart, as I have said above (*s*), that it is not easy to conjecture to which of them in particular you should ascribe the palpitation. The very excellent Kaaw, in like manner, found the heart and the pericardium connected together in two male bodies; in one by filaments, the longest of which were equal in length to the finger when extended; and in the other more closely, especially where the heart lay upon the diaphragm: but it was out of his power to learn with what disorders either of them had been troubl'd when alive, as was hinted in the beginning (*t*).

Yet out of those three men, the first of whom was dissected by that excellent surgeon Le Fay (*u*), the second by that very learned physician Pasta (*x*), and the third by Hieronymus Queye, at that time a student in physic (*y*), before the last ten bodies of which I spoke were dissected; the first had labour'd under a long and violent palpitation of the heart, with which the pulse also corresponded; the second had been often troubl'd with the same palpitation, and a difficulty of breathing, particularly after any motion of body, or emotion of mind, with a pulse perpetually unequal and intermittent; and the last had been subject to an unusual palpitation, and sudden but momentary intermissions of the pulse, and to frequent but slight swoonings. What other disorders of the heart, or of the adjacent parts, all these bodies had, or had not, besides the pericardium being generally become very much thickened, and adhering to the heart, will be presently related.

19. Now, then, if out of all these observations that I could light on while I was writing this letter, which are in number forty-five (*z*), you first set aside these six, which do not tell us what disorders had preceded, and, in the next place, take away four-and-twenty more, in which no mention is made of a palpitation, no more than fifteen will then remain wherein mention thereof is made; that is to say, two of Ballonius, and of Hiarnius, Stegmannus, the Genoese physicians, Dionis, the English, Vieussens, Freind, Agricola, Albrechtus, Haller, Le Fay, Pasta, and Du Queye, each one observation. But if you read over these very observations attentively, and see how many preternatural circumstances were found almost in every one of them, except the last, besides the adhesion of the pericardium, you will be much in doubt, whether this adhesion, or any other disease, had been the cause of the palpitation. For, to pass by the polypi that are read of in the fourth, eighth, ninth, and tenth observations, which Michelotti did not pass by in the same eighth observation (*a*), though in other respects he rightly advises us to be cautious where many diseas'd appearances are found together, at the same time, lest any one in particular should be taken for the cause of the disorder without a just and real foundation; and, in like manner, not to attend to the water, which in the thirteenth and fourteenth observations, and, perhaps,

(*s*) N. 12. (*t*) N. 17.

(*u*) Hist. de l'Acad. R. des Sc. [A. 1735.
Obf. Anat. 8.

(*x*) Epißt. de Cord. Polyp. n. 13.

(*y*) Dissert. de Syncop. c. 3. Prop. 1. n. 1.

(*z*) Vid. alias Epißt. 24. n. 3. in fine.

(*a*) Comment. Bonon. Sc. Acad. Tom. 1.
in Opusc.

in those two of Ballonius, fill'd the whole capacity of the thorax; but rather take them for the effect of this long-continu'd palpitation, and the effect of its causes; in the greater part of those fifteen observations of which I speak, you will find other circumstances to detain your attention still more.

For, to say nothing of those in which I have pointed them out upon quoting them, in the eighth, the lungs were so far impregnated with serous juices, that they entirely fill'd the cavity of the thorax: in the ninth, the part of the pericardium adhering to the heart, abounded with small abscesses, which had succeeded to the inflammation: in the sixth, the seventh, the thirteenth, the fourteenth, at one time the right auricle, and at another time the left, and even the left ventricle itself, were dilated in an almost incredible manner. I pass by other circumstances; as, for instance, in the greater part of these four, bones, either in the beginning of the great artery, or in the pericardium, or in the whole right auricle, or the narrowness and smallness of the adjoining ventricle, added to that vast dilatation of the left, as in the fourteenth; or, finally, a tumour form'd upon the pericardium itself, on the surface towards the ribs, which was equal in bigness to a small egg, and full of coagulated blood, as in the thirteenth. And just to mention a few things of this tumour only, for I have spoken of almost all the other appearances already, and in part am to speak of them hereafter, as also of this kind of tumours (*b*); see, I beseech you, what remarks Lancisi has made in the latter end of the first book of aneurisms (*c*), which he put down just by way of memorandum, as he was writing: "Observe, that the question here is of the signs by which an aneurism of the heart is distinguish'd from a tumour of the pericardium. For I have seen a certain gilder, who, when living, labour'd under a palpitation of the heart, and a straightness of breathing, and who was generally believ'd to be, without any doubt, troubl'd with an aneurism; this man died suddenly, after many blood-lettings, by which he seem'd to be eas'd. But in his body, after death, was found a very large abscess, which, when ruptur'd, pour'd out a melliceroid liquor: and it occupied the basis of the pericardium, betwixt one coat and the other." From hence you certainly perceive, that even one tumour of the pericardium may of itself, sometimes, be the cause of a palpitation.

20. And this being the state of the question, you see plainly whether in determining it, that is, in determining whether the adhesion of the pericardium to the heart excites the palpitation of this viscus, those observations ought not to have the most weight, in which no other appearance of disease was found besides that adhesion. Of which kind five, in particular, are to be met with, among all those that are pointed out above (*d*); that is, one of Sarazanus, Lower, the Genevois, Heister, and Du Queye. And mention is made of palpitation in the third, and in like manner in the last. But in this last-mention'd observation, as in the first also, it by no means appears in what state the remaining viscera and vessels were; some disorders of which may sometimes be the causes of palpitation, as reason itself, and what I have said from time to time in these letters, sufficiently demonstrate. But Lower and

(*b*) *Infra* n. 23.

(*c*) *Propos.* 5, in *ipso* fine.

(*d*) *N.* 18.

Heister, as they were diligent in the examination of the other parts of the bodies they dissected, which appears from the description of each; so, if they had contain'd any other appearances, there is no doubt but they would have been able to distinguish them, as they were well skill'd in the art of dissection, and all anatomical matters. But whether a palpitation had preceded their observations, and that of Sarazanus, you will know from what I have faithfully reported in taking notice of each.

But lest you should believe, that they had found the pericardium to adhere to the heart in some places only, or very loosely, Heister says, that the pericardium certainly was "every-where connected very closely to the heart; so that without laceration it could by no means be separated therefrom:" and Lower, "that it had every-where grown so closely to the whole heart, that "it could not be separated by means of the fingers, but with difficulty;" and, moreover, that it was "thick, opaque, and, in a manner, callous:" and this I add, lest, if you should read in most of those observations, in which I said there was a palpitation, that the pericardium was thick and hard, you should be ready to suspect, that the palpitation ought rather to be accounted for from thence than from the adhesion; although Heurnius, Peyerus, Hottinger, Laubius, and Hoffman, who have seen the pericardium thicken'd, hard, cartilaginous, and fleshy, have not remark'd any palpitation, as I said above (e).

21. But you will, certainly, enquire here, (since our observations are reduc'd to so small a number) whether in those in which Valsalva and I have seen the pericardium adhering to the heart, there was, or was not, a palpitation? And first, in regard to Valsalva, although he saw it three times, once in a boy of whom I shall speak hereafter (f), and a second and a third time in two men of whom I have already spoken in the last preceding letter (g); yet he observ'd nothing else in regard to the boy, except that he died quite emaciated: and in regard to the men, although he remark'd many and various things, yet you will read the observations over again in vain, in order to find any thing relative to palpitation, or any peculiar disorders of the pulse: and yet the pericardium not only adher'd to the heart, in all these bodies, and on all sides, but in the second of them, who had complain'd of a tightness of the chest (which might be referr'd to another cause, if any one should wish to refer it), it was, besides the adhesion, in some places very thick, and in other places cartilaginous. And as to myself, I have found the pericardium adhering to the heart in seven different bodies, and that universally. Four histories of which kind I have sent you the description of, in other places; as of the ostler or stable-keeper (b), the fisherman (i), the butcher (k), and the shearer of woollen cloth (l): in none of which it was in my power to learn whether there had been a palpitation of the heart, nor whether there had been any tightnesses of the præcordia, and disorders of the pulse; nor is it to be wonder'd at, since the butcher was bereft of his senses, and the rest were all carried off by sudden deaths, some from one

(e) Ibid.

(f) Epist. 49. n. 4.

(g) Epist. IV. n. 19.

(h) N. 4 & 10.

(i) V. n. 19.

(j) XVIII. n. 25.

(k) VIII. n. 6.

cause, and some from another: although in the sheerer, a large aneurism in the neighbourhood of the heart, had render'd the circumstance doubtful, especially as the pericardium was not of itself connected to the heart, but by means of a mucous matter that was interpos'd.

Yet in the fisherman and the stable-keeper, to both of whose hearts the pericardium adher'd immediately, and of itself, as it did in the butcher; and in the first, indeed, so closely, that it could not be separated without a laceration of the heart; I cannot easily suppose that there had been any great inconveniences of the thorax, as the first was, a little before death, equal to the laborious business of fishing. And the stable-keeper having been receiv'd into the hospital three times before his last apoplexy, had never complain'd of a palpitation; and even in that inflammation of the thorax, for which he had lain there but a very few months before, he had no irregularity of the pulse, besides the hardness and quickness usual to those disorders, as I was certainly inform'd by those physicians who had attended to his cure, while the case was, as yet, quite recent in their memory. I would not, however, deny, that an adhesion of the pericardium might take its origin afterwards, and from that very inflammation of the thorax, as I have said that Henninger, Ruysch, and Agricola had observ'd (*m*); and by this means, perhaps, that disorders of the heart and pulse, which had not existed before, might exist afterwards. But the remaining three of my observations, which were taken from one man and two women, you will read in other letters (*n*), to which they more immediately belong: and you will see, that in one only, there was an intermitting pulse and a palpitation; and this, certainly, from a very close adhesion of the pericardium, not only to the heart universally, and its right auricle, but even beyond the basis of the heart, to the great vessels which have communication with it.

22. How then, you will say, is it that Lower (*o*), Vieussens (*p*), and Michellotti (*q*), have taught us, that not only a difficulty of breathing, but the first also, an intermission of the pulse, and the third, even that an oppression of the heart and palpitation, ought naturally to be the consequence, if an adhesion of the pericardium to the heart, especially when grown hard, be suppos'd? Does not the pericardium, being become more contracted, for this reason keep the diaphragm, which is naturally connected with it, drawn upwards, and renders the depression of it, when the air is taken into the lungs, less easy; and that so much the more in proportion as the pericardium itself is more hard? And does not the diaphragm nevertheless, at the time of its descent, by hastily drawing the pericardium after it, cause the heart to be more confin'd and straiten'd by this its investing membrane, and so render the expansion of its cavities much more difficult; from whence oppression, intermission of the pulse, and palpitation consequently follow?

As to me, however, although I, perhaps, out of these three effects, more easily see the reason why the two former than why the third should happen, yet I am not ignorant what may, in like manner, be said for the third. But

(*m*) Supra, n. 19.

(*o*) (*p*) (*q*) locis indicatis supra, ad n. 18.

(*n*) XXIIV. n. 11. XXX. n. 7. XXXV. n. & 19.

where a more frequent experience is against them, as we have seen, I think it quite needless to take up time, by examining into the force of any arguments whatever. Or ought we not rather previously to consider, whether a palpitation of the heart was really wanting in all those observations where it is not mention'd? For some might have omitted it through neglect; others might not have observ'd it, though it did exist; and they not from mere negligence neither, but for that reason, also, which is remark'd after a certain observation in this eighth section of the *Sepulchretum* (*r*), in the following manner; "It sometimes happens, that though the causes of a palpitation of the heart are present, the palpitation nevertheless is not produc'd; because the patients have lain for a long time in a recumbent posture, and the blood, by reason of the quietness of the body, has perform'd its course in a very tranquil manner. For it is known by experience, that the heart of cachectic persons rarely palpitates, if they live quietly: but that from the slightest motion whatever, especially in the ascent of steep places, it is vehemently agitated." So likewise it is said below, after another observation (*s*); "It is very difficult to distinguish a palpitation of the heart, which is brought on by consent with the inferior parts, from one that is idiopathic; for it frequently happens, that although the heart contain the cause within itself, yet the effects of that cause return periodically; as when serum that is included in the pericardium is stirr'd up by an *orgasmus* or turgescency of its quantity, or when flatulencies are added."

But although these things ought to be in great measure admitted, and ought also to be transferr'd to other subjects of dispute, lest we should at any time deny that there is an organical disorder, for this cause only, because it does not perpetually produce its effects; yet can you suppose that the force of all the observations, in which I have shown that the adhesion of the heart to the pericardium had been propos'd, without any mention of palpitation, is sufficiently enervated by those things which have just been said, or by other things of the like kind? And particularly, as there are other observations to be consider'd, which were made by that diligent and cautious man Albertini (*t*), who, in enquiring after the signs of that adhesion, if any there were, is so far from mentioning palpitation, that if we consider attentively all he says on that subject, he has rather observ'd the contrary; I mean, that the motions of the heart are then naturally restrain'd and stiff'd by the pericardium, so that they can hardly be perceiv'd by us; and if they are sometimes perceiv'd, it is in consequence of another disorder; as, for instance, of the magnitude of the heart being at the same time encreas'd: and although disturb'd motions of the heart and of the pulse may come on, as in the history given by Lower (*u*), as if there were a polypus of the heart, yet "that the hand being applied to the seat of the heart, the motion of it is more sensibly felt by the physician," when there is a polypus, than when there is that adhesion.

23. While I read over again these passages from Albertini, from which it is to be suppos'd that he had often seen this adhesion of the pericardium,

(*r*) 16. in Schol.

(*s*) 31. in Schol.

(*t*) Comment. de Bonon. Sc. Acad. Tom.

1. in Opusc.

(*u*) Vid. *supra*, n. 12.

of which we speak, I observe two things besides; one that Bartoletus had very frequently, also, observ'd the same, whose books that I should at present be without will be less surprizing to you, than that Bonetus should have been always without them, as appears from the index of the authors whom he made use of in the *Sepulchretum*; and the other, that in a prince, in whose pericardium Albertini found "a bloody tumour, which was extended from "the right side of the heart, according to the whole length of that viscus;" such symptoms had preceded, as "seem'd to give us reason for supposing, "that there was an organical disorder of the varicose kind:" and he had said above, that these things happen'd when there is no pulsation, or when it is "almost insensible." But Lancisi, as appears from his observation, which I have related above (x), has observ'd a palpitation of the heart from a tumour of the pericardium; and Zacutus, from one still less, who has affirm'd, that he had seen this disorder three times, in the last preceding and seventh section of the *Sepulchretum* (y): which you must read not in the second book that is there quoted, but in the first, in order to understand the passage in the Scholium, which is itself also taken from Zacutus, wherein he has propos'd a method of cure, of some nature or other. What then is the case? Did the different kind of humour that was contain'd in the tumour, as the yellow of Zacutus, and the melliceroid, or honey-like, of Lancisi, act so differently from the bloody humour of Albertini, as to stir up a palpitation by their irritating the heart? or was the different seat of the tumour, in the different bodies, the cause of this variety? for that of Lancisi was situated at the basis of the pericardium; that of Albertini at the side of the pericardium, and at the right side of the body; but the situation of the tumour observ'd by Zacutus, he has not related. And this difference of situation may be of the greatest importance, if from the tumour which is in the basis, one or the other of the great arteries be press'd upon, and streighten'd, and thus a bar be put to the blood which is going out of the heart, from whence a palpitation will happen; which seems less to be fear'd from a tumour that occupies the side of the pericardium. Nor would I have you say, that out of these fifteen observations (z), in which a palpitation is mention'd, the thirteenth describes a tumour, in its nature and situation, similar to that which was seen by Albertini. For the tumour, in that thirteenth observation, was added to the great dilatation of the left ventricle, and to the bony beginning of the aorta: and besides, I do not hint at conjectures, especially such as do not depend upon a great number of observations, that you should follow them; but that having got together other, and still other observations, whenever you have it in your power, you may compare them with these, and at length either approve or reject them. But if it should, by chance, happen, that you confirm this last conjecture, it might then also be enquir'd, whether the heart palpitates from the adhesion of the pericardium, when the pericardium is not only so fix'd to the heart, but also to the arteries which proceed from it, that by constringing them it streightens the passage for the blood, that is about to come forth from

(x) n. 19. in fin.

(y) Obs. 110.

(z) supra, n. 19.

the heart, as it probably did constrict them in that observation of ours (*a*), which a palpitation of the heart had preceded.

Yet I would not have you suppose, that I mean, by this examination into the causes of palpitation, to bring you to reject any one of them entirely, but only to induce you to acknowledge with me, that any one cause, acting in a different manner, and in a different place, join'd with some other cause, or disjoin'd from it, may at one time produce a palpitation, and at another time not; and that you may scarcely assert more of any one cause, in particular, than what you will find said in the very beginning of this section in the Sepulchretum, in the words of the scholiographer, or rather in the words of Hollerius himself: "A palpitation of the heart may be excited by a tumour, an abscess," and other things of that kind. For it is quite a different thing to say, that it "may be excited," and to say, that it must necessarily be excited. The latter of which assertions, and not the former, seems to me to be but little agreeable to truth, in the present point of dispute.

24. I do not doubt but you have often wonder'd, in reading over this letter, that you have never observ'd me to depend upon the observations, doctrine, and authority, of the excellent archiater Senac, as if he had written nothing at all on the subject of palpitation, or as if his opinion had been very far different from mine. It is true, that he has written many things upon that subject; but I have found them, in general, so far to agree with those that I had sent you, in the compass of this letter, that I thought it would be better to speak of him a little more largely at once in this place, than to name him a hundred times over in passing. If then you read over the whole chapter that he has written upon this subject of palpitation (*b*), and what he has also said, in other parts of his work, on this affection, not in a cursory manner, but with an attentive mind, as they well deserve; you will first observe what he teaches in regard to the causes of palpitation, not only in general, but in particular. And in general he deduces the palpitation of the heart from its irritation; and in particular from such things as cause irritation, or at least furnish a cause of irritation. Some of which he shews to exist on the outside of the heart, and others within the heart itself. And in the number of the latter he places the disorders of the heart, and explains from whence the irritation has its origin, whether an obstruction be oppos'd to the egress, or to the ingress of the blood; as also, whether the cavities of the heart are dilated and constricted: on which occasion he attributes the less free egress of the blood to the dilatation of the auricles, the bulk of whose cavities, when distended with blood, compresses the trunks of the arteries that lie near to them, which you will the more readily believe, if you call to mind the small fleshy "excrescence" that was found by Garnerius (*c*) in the basis of the heart, and betwixt the arteries, which, by compressing them, brought on a perpetual palpitation. And how far the valves, subjected to the auricles, may contribute to the impediment of the egress or ingress of the blood, if they are indurated, or agglutinated on the parietes of the heart, as he found them to be in a certain man, he has explain'd in an-

(*a*) Supra, n. 21. in fin. (*b*) *Traité du Cœur*, l. 4. ch. 11. (*c*) *Señt. hac* 8. *Sepul. Obs.* 23.

other place (*d*). He has also excellently well taught, in one part of his work (*e*), that an impediment of this kind is frequently, but very unjustly, ascrib'd to polypous concretions in the heart, particularly when certain and evident causes of palpitation occur in the valves, auricles, and larger vessels; in which point Vieussens and Langelottus thus have fail'd. Then, as to the causes that are on the outside of the heart, you will see, that in the number of these he reckons the nerves, when irritated in the brain, or elsewhere; and even without any regard to the nerves, the compression of the pulmonary vessels: in treating of which, with his usual excellence and perspicuity, he does not omit to admonish us, how cautious we ought to be of accusing this last cause, inasmuch as a palpitation is frequently not the consequence of this alone. Moreover, unwillingly to pass over a great number of very useful things, of which he must necessarily treat, in conformity to his plan, and to leave off, as I began, by insisting on those things of which I have had occasion to write, especially such as relate to the pericardium; he shows how a palpitation may happen from a dropsy of this cavity: but of ambiguous marks, either of tumours of this part, or of the more uncertain observations of worms existing there, he treats very judiciously, in another place (*f*): where (*g*) he also weakens the force of those examples of the pericardium being deficient, and confirms the adhesion of it to the heart, by his own manifold observations: and he teaches what kind of adhesion, and to what parts of the heart, it is that serves as an impediment to the motion of the heart, or is the cause of palpitation (*b*): nor does he fail to put us in mind how cautious we ought to be, where there are many different causes together, and particularly those of a more important nature, lest we rashly ascribe the palpitation to adhesion; and admonishes, in general, that where there are many causes together, it is not possible for us to distinguish the peculiar effects of each; and even that all together may jointly produce certain effects, which when separate they were by no means able to produce.

And these things also are excellent (*i*): that where the signs of those causes or diseases are ambiguous or obscure, the physicians must take great pains, and be making continual enquiries, in order that they may be, at length, illustrated and clear'd up: and that though they should not be able to attain to this, yet they might, in the mean while, be reaping this advantage from their enquiries, that they would naturally become more cautious, in pronouncing upon diseases, and in determining the method of their cure; and by this means greatly improve the physical science, in which the history of all the diseases that men are liable to, altho' some of them are not discover'd till after death, is, of itself, sufficiently worthy of our knowledge and attention. But if it at length happen, as it does happily fall out in many causes of palpitation, that they are sufficiently known and distinguish'd from each other; how great an advantage must arise from thence in the prognosis of diseases, and how great in the method of curing them, nothing, believe me, can show more clearly than what this very great archiater, supported by reason and

(*d*) Ch. 9. n. 5.(*e*) Ch. 10. n. 10.(*f*) Ch. 5. n. 2. & 3.(*g*) n. 4.(*h*) Vid. etiam ch. 9. in fin.(*i*) ch. 5. n. 1.

experience, has, in a very copious and distinct manner, subjoin'd to the examination of these causes, in the much greater part of the chapter upon the palpitation of the heart, which has been already pointed out. And after having read this, you will no more wonder, that in so great a plenty of remedies as the antients have left us against this disease, so many occur, at one time or other, which very evidently counteract each other. For as the causes of palpitation are so various, and some of them so diametrically opposite to each other; it is of course necessary, that each must be counteracted by different remedies, and some of them even by such as are directly adverse to each other. The causes, therefore, being digested, every one in their proper order, from that kind of confus'd chaos, the particular remedies, as he truly says, distribute themselves naturally, if I may be allow'd so to speak, every one into their correspondent places. However, though what I have now said may be sufficient to stir up in you a desire of reading the whole work, yet it is by no means sufficient to render a just praise to writings so highly deserving thereof. Farewel.

LETTER the TWENTY-FOURTH

Treats of Preternatural Pulses.

1. **I**F I should take upon me to discourse on every disorder of the pulse, in this letter, I should undertake not only an infinite but a useless labour. For what disorder is there of the more considerable kind, in which the pulse is not, in some measure, in fault? or in which it is in our power to shew the true cause of this variation from anatomy.

It will, for these reasons, then, be sufficient to attend pretty diligently to some of the more considerable disorders of the pulse, which, on that account, particularly attract the study of the physician, and the researches of the anatomist, beginning with the most considerable of them all: which seems to me to consist in that smallness and debility of the pulse, so that, as it is now no longer perceiv'd, the patient is said to be seiz'd with an asphuxia, or to be, at present, without pulse. And to this the observation of our Valsalva relates, which runs in the following manner.

2. A man, of fifty years of age, having some time before escap'd very happily from a peripneumony, fell again into a disorder of the thorax. For besides that he complain'd of thirst, and a dry cough, it was not in his power to lie down on the left side. And as often as he attempted this, by turning himself a little towards that side, the more he continu'd to turn himself, the more he perceiv'd that a swooning was coming on: to avoid which, he re-
turn'd

turn'd to a supine situation, or lay upon the opposite side. Whether he had a fever or not could not be discover'd from his pulse, as no pulse was perceiv'd.

After death, the pericardium was found to be very much dilated, and fill'd with a purulent matter diluted with a large quantity of serum. The membrane which invest'd the heart was extremely thicken'd: and from this to the pericardium, two solid and firm productions were carried, each of them in the form of a cylinder, like a thick and short ligament, strongly connecting the heart to the pericardium. One of them had taken its origin near the right auricle, and was continu'd in a horizontal direction into the anterior side of the pericardium; and the other went from the very apex of the heart itself into the apex of the pericardium, and in so tense a state, that at the time of the systole the apex of the heart could not be brought towards the basis, unless it drew the pericardium with it, and consequently the diaphragm.

3. According to this animadversion of Valsalva, it will seem very easy to you to understand this cause of an asphuxia; that is, from the heart being so confin'd, that in thrusting out the blood it was scarcely able to perform its office even slightly. You will also believe, that you are not ignorant of the reason why the patient was threaten'd with a swooning, from attempting to turn on the left side of his thorax; without doubt, because the great quantity of matter which distended the pericardium, did then most oppress the apex of it, and by that means increas'd the resistances to the heart when about to contract itself, so that it was now by no means able to execute its office. Nevertheless, there may, perhaps, be some things which prevent you from understanding the case in this manner. I pass by those things which I remember to have heard from Valsalva, of a band drawn betwixt the pericardium and the side of the heart, in a man who had different pulses from the different postures in which he lay: and what you will read in Albertini (*a*), of the tremor of the heart, if the patients underwent any quick motion, in whom he found "the pericardium tied in a lax manner to the heart, by a "thin membranous band;" and also what you will read in the Sepulchretum (*b*), of the inequality of the pulse in a man whose "pericardium adher'd by fibrous connexions to the middle region of the heart, and indeed "to its adipose substance," as I have already said in the former letter. For you would say, that all these connexions were more lax than to obstruct the motion of the heart, in such a manner as to bring on an asphuxia, especially as they did not relate to its apex.

But what will you say to the observation of the illustrious Haller (*c*), who saw "the heart grown to the pericardium by fleshy fibres ascending from "the apex, without any inconvenience to the man, as far as he knew?" Certainly, had he labour'd under an asphuxia, it could not have been unknown. Will you then say, that this connexion also was but lax, which he has said in another place (*d*), for he seems to be speaking of the same, "had

(*a*) Comment. de Bonon. Sc. Acad. Tom. I. in Opusc.

(*b*) L. 2. Sect. 1. in Addit. Obs. 32.

(*c*) Dissert. de Vasis cord. propr. not. ultima.

(*d*) Ad Boerh. Praelect. § 182. not. m.

" confin'd the apex of the heart like a bridle?" However, let us suppose that it was lax: yet was it lax in that great number of observations which are taken notice of in the former letter (*e*)? In them the pericardium itself, certainly, was become connected, not only to the apex of the heart, but to the heart universally: yet there is not one of them in which an aphuxia was observ'd, even in the latter part of life. And, indeed, although three other observations of very famous men are extant, as of John Fantonus (*f*), Benedict Gulmann (*g*), and of the same Albertus Haller (*h*), whom I just now deservedly commended, which escap'd me, I know not how, as I was revising that letter; in the first, nothing is mention'd, but "that the heart perform'd its motions in a convulsive manner;" in the third, not even this; and in the second, though a palpitation of the heart, an inequality of the pulse, an asthma, and other symptoms, are particularly taken notice of, yet an aphuxia is not at all mention'd; notwithstanding the left ventricle of the heart was, both internally and externally, of a cartilaginous firmness; and notwithstanding the pericardium, in the observation last spoken of, being fleshy, and in the first cartilaginous, was connected "strongly to the heart" on all sides, and very closely, intimately, and tenaciously," as in the third also.

What answer, then, must we give? And what think you of the following? That Valsalva, besides this connexion, had found the external membrane of the heart grown much thicker, and the pericardium fill'd with a serous and purulent matter. For the thickness of that membrane was, perhaps, the cause that the heart could not sufficiently expand itself; and as, for that reason, it could admit but little blood, nor could the small quantity which would be soon after expell'd into the arteries, nor the force with which it was extruded, be able sufficiently to dilate them, being confin'd by this connexion, and relax'd from that matter besides, by reason of its being serous; and as in consequence of its being purulent also, the heart was in some measure tainted by it, whether this matter had been translated hither from the lungs in the declension of a peripneumony, or whether the peripneumony had, also, had an inflammation of the membrane of the heart join'd with it: but which of these two is the most credible, by reason of our ignorance of those things which had then afflicted the patient, and of what was found in the lungs after death, does not appear. It is true, indeed, that the inflammation of both or one of these membranes had, more than once, troubl'd the patient, from the coalition of one with another, according to the observations of Ruysch and Freind, taken notice of in the former letter (*i*). But it is also true, that the serum being impregnated with thick particles, and such as are readily prone to concretion, they are often press'd out within the pericardium, especially of those who labour under a peripneumony, as I have written to you before (*k*). And that from concretions of this kind somewhat like hairs may be form'd, if they adhere to the heart in a slender and disjoin'd manner; and if two or more of them are crowded together, as if bundles of rods

(*e*) N. 17, 18. & seqq.

(*ff*) Anat. corp. hum. Diff. 11.

(*g*) Act. N. C. Tom. 1. Obs. 4.

(*h*) Opusc. Pathol. Obs. 49.

(*i*) N. 18, & 19.

(*k*) Epist. 20. n. 37.

were drawn betwixt the heart and pericardium, that thick bands may be produc'd, tying the one to the other; the second, indeed, is hinted at by Riolanus (*l*), but both of them are confirm'd from observations by Weitbrecht (*m*). For Riolanus had said only this, "If the water of the pericardium be thick and viscid, the crassamentum of it is converted into hairs. And from "hence the heart has been observ'd in some bodies to be hairy." Yet when I attend to the firmness of the band found by Valsalva, and the membrane of the heart being so much thicken'd, besides the pus, I am much more inclin'd to suspect, that it had been produc'd in the first manner than in the second; I mean, by a coalition, and that not of the straightest kind, which happen'd at the apex only.

4. But if the mention accidentally made of the heart being hairy should chance to make you desirous of knowing whether I think, that whatever is extant in regard to hairs being found upon it, in historians, and in like manner among physicians, is to be explain'd in the same manner which I hinted at just now; I would have you understand, that most of the ancient examples of this observation seem to me to be very doubtful; and that for more causes than one. For as to what Valerius (*n*) had asserted to have been found by the Athenians in Aristomenes Messenius, Pliny (*o*) afterwards asserted, that this was done by the Lacedemonians; and Pausanias (*p*), that Aristomenes had not died a captive in the hands of cruel enemies, but in a state of freedom, at a great distance both from Athens and Sparta, as he had pass'd over to his son-in-law among the Rhodians, where "he died a natural death." And as to what Plutarch (*q*) relates to have been seen by Xerxes, in the heart of Leonidas, when cut out, in conformity to Aristides, who wrote of the Persian affairs, the heart, it is true, might be cut out by a barbarous and hostile king; but it is scarcely probable, that in a man who fought very gallantly to the last, the heart had any thing morbid in it. And I would have you suppose that I say the same things of Lyfander, who being at the head of his army, and under the walls of Haliartus, "fell in battle (*r*)."
I grant you, indeed, that his body after death might be torn into pieces by his Theban and Athenian executioners, who hated him most bitterly. But neither Pausanias nor Plutarch, in the life of Lyfander, do by any means hint at this fact, though the latter has told us that the body was return'd to the Lacedemonians.

Eustathius, as far as I know, is the only one who makes mention of it in Lyfander, and in the dog of Alexander, as you have it in Cælius Rhodiginus (*s*); who adds, that, among the Grecians, the same circumstance was also found in Hermogenes, a writer in the art of rhetoric. But although I am willing to confess, that this dog might be dissected, I should not, however, readily believe that this rhetorician was dissected, as he died in those times in which it was not allowable to dissect human bodies; and as by reason of long-continu'd idiotism, or stupidity of mind (*t*), into which he fell from

(*l*) Anthropogr. l. 3. c. 7.

(*m*) Comment. Acad. Sc. Imp. Petropol. Tom. 6.

(*n*) Fact. ac Dict. Memorabil. l. 1. c. ult.

(*o*) Natur. Hist. l. 11. c. 37.

(*p*) De tota Græcia, l. 4.

(*q*) In Parallel.

(*r*) Vid. Pausan. Oper. cit. l. 3, & l. 9.

(*s*) Lect. Antiq. l. 4. c. 16.

(*t*) Ibid. l. 21. c. 6.

the most keen and juvenile ingenuity, he was rather entitled to the commiseration of every one, than to the hostile hatred or rage of any one; in consequence of which it might be suppos'd, as it might have been of the former, that he was inhumanly treated after death. You see, then, why I suspend my belief in regard to most of the ancient examples, and fear lest men should be more inclin'd to believe these circumstances because Homer, in order to denote wisdom, as Eustathius (*a*) thinks, has been observ'd to say, "that the heart was thick with hairs;" and Nonnus (*x*), also, that he might better express the boldness of the Sabines, has attributed to them "a heart invested with thick hairs;" whether they suppos'd that a kind of prudence, subtlety, or boldness, could not easily exist without a hairy heart; especially since, to pass over to less ancient examples, they have read in Muretus (*y*), Benivenius (*z*), and Amatus Lusitanus (*a*), that a heart of this kind was found in three robbers, who had been eminent for their wickedness and boldness. The last of which authors does not give any hints of what kind the hairs were in the man who, he says, was dissected by him: nor yet does Scultetus Noribergerensis (*b*), who says, that in a young man who was, in like manner, very bold and audacious, and was dissected in this very anatomical theatre, in the year 1650, the heart was found to be "every-where beset thickly with hairs:" nor, in fine, did Lanzonus (*c*), who found in a plebeian that he dissected, the heart "universally hairy." Yet in regard to this man, as it appears that he had been peripneumonic, it is natural to conjecture, that he had not hairs upon his heart, but viscid concretions, which following the pericardium when it was remov'd from the heart, by their slenderness and whiteness represented hoary hairs. But whether there be room for the same conjecture in the others who are just now spoken of, I would not be too hasty in determining: although in regard to the robbers, as they are generally confin'd for a long time in a very filthy jail, in order to make them discover their accomplices, and confess all their robberies, it is allowable to suppose, that they labour'd under a cachexy; and that from this cause a plentiful, and perhaps viscid and thick humour had stagnated in the pericardium.

Nor will you imagine, because the young man dissected in this theatre had died immediately from a wound he had receiv'd, that, for this reason, he had been of course in good health while living, in regard to his heart and pericardium, especially after you have read, that (*d*) "for many years he had complain'd of a heat in his heart." And if you observe besides, that neither Anthony Molinetti, nor Peter de Marchettis, nor Dominic the son, who was an assistant to his father, nor the friend of all these, John Rhodius, who collected such a great number of the more rare observations that had been taken here, have made, as far as I remember, any mention of this circumstance in question; notwithstanding some of them, by reason of the offices enjoin'd them, and others, by reason of their constant attendance in the theatre, could not have been ignorant of it; I say, have not made any men-

(*a*) Ibid. l. 4. cit. c. 16.

(*x*) Apud Maret. Var. Lect. l. 12. c. 10.

(*y*) Ibid.

(*z*) De addit. Morb. &c. Caus. c. 83.

(*a*) Cent. 6. Curat. Med. 65.

(*b*) Trichias. admir.

(*c*) Eph. N. C. Dec. 3. A. 5. Obs. 122.

(*d*) Trichias. cit.

tion of it, not even where Anthony or Dominic have since written of the heart, and of this kind of hairs : if, therefore, you observe these things, you will certainly be of opinion, that those appearances, which at first sight seem'd to be hairs, had, when examin'd into more nicely, been found to be very far different from them. And, indeed, when I call to mind the rank and family of that young man, both of which forbid him to be brought into the theatre, and publicly dissected, I should suppose that this case had been forg'd by somebody, and related to Scultetus in some other place, if it did not appear from the books of the university, in which the names of those of this famous German nation are register'd, that he spent that whole space of two years here, in which the year 1650 falls ; and that for the sake of carrying on his studies, which the Germans had always done, nor did afterwards cease to do, as long as all were at liberty to do it. They who think otherwise would see, if they could inspect these books, that this custom had been really preserv'd (to pass over almost an innumerable number of those who are less known) by Philip Jacob Sachsius, Jacob Pancratus Bruno, Christian Mentzelius, Paul de Sorbait, Jo. Sigismund Elsholt, Erasmus Bartholin, Michael Syferus, Henry a Moinichen, Jo. Daniel Major, Mark Map-pus, Gabriel Clauderus, Henry Meibomius, Michael Etmuller, Jo. Nicolaus Pechlinus, George Abraham Marcklin, Paul Hermann, Luke Schrock the younger, Charles Raygerus, David Vander Becke, Godfrey Schulz, Jo. Fabricius, Jacob Barnerus, Jo. Maurice Hoffmann, Jo. Caspar Spar, Ferdinand Charles Weinhart, Vitus Riedlinus, Francis Stockhamer, Jo. Adam Limprecht, Jo. William Pauli, Jo. George Wolckhammer, Michael Frederic Lochner, Jo. Sigismund Henninger, George Dethardingius, and Jo. Adam Gieselius, who was also created Doctor here in the year 1702, as a great number of the preceding gentlemen were in like manner.

But it is sufficient for me, lest I should pass over, without intention, any one of the juniors, to have brought you down from that very year 1650, through the succession of the following years, quite to the beginning of the present age ; so that you may easily perceive, whether about the middle of the former age, so great a change of things was made in Italy, that foreigners left off more and more to come among the Italians on account of their medical studies ; being influenc'd by this reason among others, that in Italy, through the whole of that age, they still follow'd the theories of Galen ; as if Thomas Cornelius, Leonardo de Capua, Marcello Malpighi, Jo. Alphonso Borelli, Francesco Redi, Laurence Bellini, Luke Tozzi, Bernardin Ramazzini, and others, who have been celebrated among our own countrymen, and among foreigners, had either been followers of Galen, or had not, after the middle of the preceding age, adorn'd Italy with their doctrine, and with their writings. At which time, neither Carlo Fracassati, nor Francesco Spoleti, nor Jo. Baptist Scaramucci, nor, finally, Pompeius Sacchi himself, were by any means propagators of the Galenic theories, as their lucubrations shew ; as also the works of Dominic Gulielmini, and George Baglivi ; for some pieces of both these gentlemen had come out before the conclusion of that age.

And since nothing but the love of truth has brought me to this digression, suffer me also to admonish you of this one thing, which relates equally to the

literary history of the same age, that, if you at any time read the catalogue of the Paduan professors from the year 1611 to the year 1694, given in the *Acta Eruditorum*, which are publish'd at Leipfic, and in the first volume of these Acts (*e*), I would have you take notice, that no others are spoken of in that catalogue but such as taught the several arts in that year 1682; and that, therefore, the names of Galilæo, Sanctorius, Casseri, Spigellius, Vesslingius, Peter de Marchetti, Anthony Molinetti, Prosper Alpinus, Jo. Pravoti, and Sertorio Ursato, are, of course, deficient; not to mention a great number of other illustrious men, who, within that space of more than eighty years, encreas'd the fame of this our university.

But to return to Scultetus: although it does not sufficiently appear, either from his writings, or the writings of those I pointed out before him, whether real hairs were ever found within the pericardium, or only a similitude of hairs; yet I would not obstinately deny but it might happen, that, as I myself found a little bundle of hairs within the dura mater of the brain (*f*), and others have found hairs in other places, and even within the right ventricle of the heart of a dog (*g*) (could they be carried thither with the blood from the purulent parts in which they were?); so, I say, I would not obstinately deny, that some person may have found, or may find, the heart to be sometimes, in fact, hairy: but if this should ever happen, I would recommend to the observer to use great diligence in examining into their nature, and in comparing them with real hairs. And I so much the more rejoic'd, upon revising these letters, that I had with-held my assent in this manner in regard to these appearances, as the illustrious Senac (*h*), where he treats of the observations which assert that the heart was hairy, does himself also think in the same manner. But let me return from my digression, which has been longer than I thought in the beginning it would have been, and yet, for more than one reason, not altogether useless, not to say necessary, to me, and go back to the purpose of my letter.

5. In the papers of Valsalva I find no other observation but that which has been given (*i*), that relates particularly to the pulse; whereas there are a great number which relate to this, at the same time that they relate more to other circumstances: so that I have, for these reasons, describ'd some of them to you already, and shall describe others hereafter. I shall, therefore, proceed to add my own, which are not in very great number: nor need you wonder at it; for in the ninth section of the Sepulchretum, although five and-forty observations are produc'd, yet the first seven ought to be blotted out, on account of their being repeated, as you will immediately see by comparing the eighth with the twenty-seventh, the twelfth with the forty-third, the thirteenth with the thirty-ninth, the fourteenth with the forty-fourth, the sixteenth with the twenty first, and the thirty-eighth with the forty-first: and Bonetus himself expressly admonishes, that out of the remaining observations there are twenty-four which belong so much the more to other heads, as they are given the more at large under those heads. Wherefore, from forty-five we are

(*e*) Pag. 375.

(*f*) Epist. Anat. 20. n. 58.

(*g*) Act. Erud. Lipf. M. Maj. A. 1684. p. 215.

(*h*) Traité du Cœur. l. 4. ch. 9. n. 1. & seq.

(*i*) N. 2.

reduc'd to fourteen. But be this as it will, I would have you receive with a willing mind what it is in my power to furnish you with; and first this observation, which itself also relates to an asphuxia.

6. An old man had already lain in this hospital three months from the time of breaking his leg, being troubl'd with a slight but obstinate fever, when, contrary to expectation, it was suddenly observ'd that the man had no pulse, though it had not been accusom'd so much as to intermit, and notwithstanding he affirm'd that he was not worse at this very time than he us'd to be. And to confirm what he said, he immediately lifted himself up in bed, and sat upright: yet very soon after he really died.

His head, together with his neck, and the greater part of the viscera, were accurately dissected by me, in order to demonstrate to the students, at that convenient season, for it was about the beginning of December, in the year 1730, many parts which do not relate to the subject now in hand. But what appearances of disease there were, or of any thing preternatural, fall, of course, under our present consideration. Although no water had come forth from the tube of the vertebræ, while the upper vertebræ of the neck were disjoin'd from the lower, yet a considerable quantity flow'd out from the cavity of the cranium, while it was cut through round about. And there was no small quantity in the lateral ventricles. Yet the substance of the cerebrum was not only not lax, but perhaps the hardest of all the substances which occur'd to me: nor were the blood-vessels pallid, but even fill'd with black blood in the greater part of them, and especially the sinusses. In those two arteries which run between the two hemispheres of the brain, and near the upper surface of the corpus callosum, were bubbles of air contain'd: and yet the weather was very cold, and it was no more than the third day after his death, nor was there the least mark of putrefaction. A considerable portion of the parietes of the right carotid artery, where it arose from its receptacle, was become thicken'd, and of a middle nature betwixt a ligament and a cartilage, yet still on its internal surface was membranous: a disorder of which kind seem'd, also, to have already begun in other of the larger arteries of the cerebrum. But on the outside of the cranium this ossification was still more considerable. For on one side of the neck, at the very division of the carotid artery, a pretty large bony plate was within its coats: and the trunk of the same artery was universally and considerably dilated, whereas in the other carotid there was a proper degree of latitude.

However, when I examin'd the viscera of the thorax, and the great vessels, I no-where observ'd any dilatations; although the aorta, near to the valves, shew'd some tokens of a future ossification, and in other places also; and, indeed, it had a small bony lamina under its innermost coat, where, having sent off the left subclavian, it already began to descend. The ventricles of the heart, and especially the right, and the great vessels, were occupied here and there with polypous concretions; and in one of these vessels was a whitish kind of concretion, of so compact a nature, that it greatly resisted the fingers when we attempted to pull it asunder.

The viscera of the belly had no mark of disease, except one of the kidneys, which, under its own proper coat, contain'd a cell capable of admitting a horse-bean; and this cell was full of serum. I will not omit even this, that,

at the sides of the feminal caruncle, granules, as it were, of tobacco were found; and that in the pendulous part of the urethra there was no more than one of all the little canals found out by me; and that a very small one. And to shew you the more clearly, that I had neglected nothing of any appearance which seem'd to depart, even in a small degree, from the general custom of nature in this body, take also this observation, that from almost the whole circle of the helix of both the external ears, such long hairs hung down, in this man, and grew so thick, that you rarely meet with whiskers which could be compar'd with these hairs.

7. You must consider with yourself, whether you would have this short asphuxia accounted for from the water being suddenly extravasated within the cranium, which, not being able to injure the cerebrum greatly, as it was in this body very hard, so compress'd the cerebellum, that, the influx of spirits into the heart being diminish'd, it could not at first drive forth the blood into the arteries, except with a weak and almost insensible impulse; and soon after, when death at length came on, it could exert no impulse at all. So also, if you read over again the fourteenth letter that I have sent to you (*k*), you will see, that the boy whose cerebellum had been partly destroy'd by pus, had been entirely without pulse for a great number of days. But if you should, perhaps, be less pleas'd to explain the case in this manner, which does not exceedingly please me, or by any other theory of this kind, than to refer the whole to those polypous concretions, you will then, indeed, have a great number of modes of explication, by which, if you stretch them to their utmost extent, you may, at length, bring this reference about; but whether you can do it with justice, or not, you ought to enquire with diligence again and again. You may be sure it does not escape me, that you may read, in the Sepulchretum, two observations of an asphuxia, the one (*l*) in a man for a whole day, the other (*m*) in a virgin for four-and twenty hours, both of which describe concretions of this kind found in the heart; and that to these may be added, from others previously publish'd, although omitted in that work, one of Sebastianus Pissinius (*n*), made upon a noble matron, by name Clara Spada, who, having been without pulse "for forty days and more," exhibited bodies of this kind in both the ventricles of the heart: and, moreover, not to depart from the Sepulchretum; that the large vessels of the heart were fill'd with concreted blood in a man who had, for a very long time, labour'd under an asphuxia (*o*); and that, in another who had been affected in the same manner "for four months before his death, "no other cause" of so long-continu'd an asphuxia was found, but ten or twelve coagula of black, thick, and concreted blood in the aorta near the heart (*p*).

But not to enquire, whether, in all these observations, there was no cause besides, and especially in this last, which, as it is given in more than one place of the Sepulchretum (*q*) pretty much at large, may be better examin'd into by you; or in that which I said related to a virgin, in whom you will

(*k*) N. 3. (*l*) Sect. hac 9. Obs. 4.

(*m*) In ipso fine Sect. 8.

(*n*) Epißt. de Polypo Cordis.

(*o*) Sect. hac 9. Obs. 45.

(*p*) Ibid. Obs. 7.

(*q*) Ex gr. I. 2. S. 3. Obs. 22. § 2.

observe that the heart was very much enlarg'd; I shall have a very proper occasion below (*r*) of admonishing what ought to be done, before we depend upon observations of polypous concretions without an almost certain danger of falling into errors. In the mean while, however, call to mind that young man, whom I describ'd in the latter end of the twenty-first letter (*s*), as being without pulse, and whose heart, like that of the virgin, was very much enlarg'd, but without any concretion of blood. And the fibres of this heart, being soften'd to the greatest laxity, may render it doubtful, whether this, or the enlarg'd state of the heart, deserv'd most to have the asphuxia attributed to it; although there seems not the least reason to doubt, that it was owing to the conjunction of both. So, also, you will remember, that in the eighteenth letter (*t*) a woman has been describ'd, who had her heart, in the same manner, much enlarg'd; yet that I, nevertheless, thought the cause of her frequent asphuxia could not be sufficiently explain'd without the addition of convulsion. For although, as often as she was seiz'd with a convulsive asthma, as it seem'd, and came into the hospital, her pulse could not be perceiv'd; yet it is more probable, that she had been without pulse only in the paroxysms, as hysterical women frequently are, than that she had been continually without any pulse for the space of six years together. For they who are continually without a pulse, do not seem able to live so long, (although Riolanus (*u*) says, that he has seen such persons live even much longer, but "with the most extreme dejection of strength," which was not in this woman) unless it should happen from the arteries, which physicians are us'd to feel, being either small, or not lying in their natural situation, or for some reason or other obstructed; none of which circumstances was found in this woman. And they are small in those persons where they are divided into many, or in whom the ulnar arteries have happen'd to be the thickest: and they are out of their natural situation, when they are situated at a greater depth than usual; where they were found by the celebrated Torr  s (*x*), in the dissection of a woman who, when living, seem'd to be without pulse; or when they run upon the back-part of the radius; for this course I should suppose the artery must have taken in Starkmann (*y*), whose pulse was not in its usual seat, but between the thumb and the fore-finger. And that it may be obstructed in more ways than one, I shall shew presently.

8. Other examples of that kind of natural asphuxia, either in both of the wrists, or in one of them, you find remark'd in the Sepulchretum (*z*); so that there is no occasion to relate such as have occur'd to me in the practice of physic. And you have, at the same time, the method pointed out, which we ought to use, by way of caution, to prevent our being impos'd upon by either the one or the other kind of asphuxia: although the second can, indeed, deceive no physician whatever, but such as having felt one writ only, immediately pronounce upon the pulse, which I wonder that Minadous (*a*) should do; for in proportion as one pulse seems to be the more terrify-

(*r*) N. 30. (*v*) N. 49.

(*t*) N. 34, & 35.

(*u*) Encheir. Anat. l. 5. c. 46.

(*x*) Diff. de Cord. inverfo.

(*y*) Eph. N. C. Cent. 10. Obs. 42.

(*z*) in Schol. ad Obs. 1. Sect. hujus, & ad Obs. 10.

(*a*) Ibid.

ing, so much the less ought the examination of the other to be omitted: and if the pulse be deficient in both wrists, other arteries are to be examin'd; as, for instance, the temporal arteries and carotids; and finally also, when it is permitted, the crural arteries, which have a pulsation in the groins; for it is not altogether true, "that the evidence and magnitude" of the carotid arteries "is no less" than of these; though it does not escape me, however, that by reason of their lesser distance from the heart, they are worthy of peculiar attention in regard to this point.

And either kind of asphuxia does sometimes happen from an accidental obstruction of both or one of the arteries, which we generally feel in the wrists; nor are examples of this kind wanting in the Sepulchretum (*b*). And to these belongs that which Lancisi (*c*) takes notice of, and which I have seen in "the marquis Paulucci." For he refers to the same nobleman, of whose disease and dissection I have written the greater part to you already (*d*): to which you may also add this for a certainty, that in the left wrist no pulse could be perceiv'd. But whether this was owing to a polypous concretion, that almost fill'd the left subclavian artery, in which way a similar observation, that was afterwards made in another nobleman, is explain'd; or whether it could be accounted for from any other cause; as I was absent, and did not examine the aneurism which was at the curvature of the aorta, I leave quite undetermin'd. However, I remember a certain observation of Harvey (*e*), which I do not find in the Sepulchretum; I mean one, in which an aneurism was found "on the right side of the neck, near to the descent of the subclavian artery into the axilla, that had its origin from the corrosion of the artery itself; -- and that in this man the pulse of the same arm was very small, for this reason, because the greater part of the blood was diverted from its usual course into the tumour."

But from what cause shall we say it happen'd in a much shorter disease; I mean, in a peripneumony, that the man from whom the thirtieth observation of this section was taken, "had the pulse in his right hand almost abolish'd?" Was it from what the author of the observation, Saxonia, says, "that the inflammation in the right side of the lungs was more hard, and more extensive?" And if it were from thence, was it for this reason, that the right subclavian artery was compress'd by the neighbouring lungs being in that state? But if we suppose this, we must then consider to what cause it can be owing, that where there is a similar inflammation of the lungs on one side, and in their upper part, which certainly is no very rare case, we do not find a similar abolition of the pulse on the same side.

Yet I should much more readily believe, that a vomica of the lungs had been discover'd, in dissection, by Spindlerus (*f*), to have been the cause of an asphuxia in an infant, than I should grant, that from a disorder of the lungs, on the left side, (which a celebrated professor formerly said he had predicted from the pulse, and that he found agreeably to his prediction) the pulse in the left wrist, in like manner, had become very low and very weak.

(*b*) in Schol. ad cit. Obs. 1.

(*c*) De Aneur. l. 2. Propos. 38.

(*d*) Epist. 17. n. 26. & 27.

(*e*) De mot. cord. Exerc. 1. c. 3.

(*f*) Vid. Act. Lips. A. 1691. M. Janu.

9. But to pass by these asphuxiæ of one or of both the arms, whether they proceed from disease or from nature itself, and those also which occur in all the arteries whatever, that physicians can feel about the latter end of mortal disorders, and that frequently for the space of two or three days before death, and which therefore are not to be wonder'd at, inasmuch as they are join'd with the greatest dejection of all strength and vital powers, and a dullness of all the senses; there certainly is great difficulty in accounting for those other species of asphuxia, which I spoke of above. For the patients have their internal and external senses in a very vigorous state; they speak with ease; they turn themselves from side to side (*g*); and some even raise themselves up hastily (*h*); and which our Ramazzini saw himself (*i*), a young man, who was a Jew, in whom, for four days, "the arteries had pulsated in no part, was so robust and strong, and so nimble in his motions, that even on the very day on which he quitted this state of the living, he rose up out of bed, and put on his clothes." He had been, indeed, for the whole space of those four days, quite cold, and had not discharged any urine. But coldnesses and renal ischuriæ were, in other respects, "very frequent" in those patients (*k*): yet I do not remember, that either of them has been observ'd in most of the histories of this kind, till, perhaps, about the end of the asphuxia; yet in that fellow-citizen of mine, at least, whom I have taken notice of in the *Adversaria* (*l*), coldnesses, at length, came on the last night; and I then saw that the urine was, indeed, of a black colour, but not suppress'd.

Now then suppose whichever cause of an asphuxia you please, out of those that generally happen, and that are taken notice of above (*m*); and then tell me, I beseech you, why the motions and functions of the other parts do not cease immediately, as they do in a syncope, when the motion of the arteries is ceas'd? You will say, that in an asphuxia the heart is not only not at rest, which I myself acknowledge, for even Pissinius confesses, in regard to the noble matron Clara Spada (*n*), "that the hand being applied to the left part of the thorax, there appear'd to be a kind of obscure motion in the heart;" but that the arteries themselves, especially the larger and more internal arteries, do really pulsate, though it is but very slightly. Yet you cannot clearly show how it happens, that in so great a diminution of the motion of the blood, the patients are able to do those things which I just now mention'd; and why paleness, coldness, dullness, and an incapacity of speaking, eating, and moving themselves, do not immediately come on, as they did not in that man whom I saw: and even why, after "they have liv'd many days together in an entire state of coldness," the power still remains, in some of them, of again "growing warm," as Ramazzini has observ'd (*o*); nay, what is still more, of reviving into very good health again, after having been, for six whole days, without pulse, as I have taken notice of from Bartholin, in the *Adversaria* (*p*).

(*g*) *supra*, n. 2.

(*h*) n. 6.

(*i*) *Constit. Epid. A. 1692. & seqq. n. 23.*

(*k*) *Ibid. n. 53.*

(*l*) *II. Animad. 44.*

(*m*) n. 3. 4. 7.

(*n*) *Vid. supra, n. 7.*

(*o*) *Constit. cit. n. 33.*

(*p*) *Animad. indicata.*

But you and posterity will, perhaps, clear up these things: as to myself, I ingeniously confess, that I am not quite clear on this head, which I there also acknowledg'd (*q*).

But you will, perhaps, say here, that it is much more difficult to conceive, how life can be preserv'd in those who have been long plung'd under water, and are brought out like dead persons. For that in an asphuxia, respiration, and consequently some internal kind of circulation, does, at least, continue, which, in the others, is entirely intercepted; and for this reason it must of course happen, that the circulation is entirely suspended; because without the air alternately to dilate the vessels of the lungs, no blood can pass out from thence into the left ventricle of the heart; and if this cavity throw out nothing into the arteries, the circulation immediately fails.

And who do you suppose will deny, that these things are also very difficult to be explain'd? Yet these drown'd persons lie like those that are really dead: whereas those who are seiz'd with an asphuxia, go on to perform all the functions that healthy men are wont to perform, as I have said; and not only such as living men necessarily perform: and this was chiefly what excited my wonder. Hereafter, perhaps, some light will be thrown upon this very obscure subject, if the carcase of the woman, who perhaps still lives at Paris (*r*), shall be examin'd with such care as it ought to be, and as they generally are in that place: although the asphuxia of this woman has been from her very birth; and if we consider what kind of a body hers is, as to its colour, heat, menstrual purgations, and health; and at the same time, if you consider the smallness and spare habit of her only child; it will seem to be less surprizing that not the least pulsation of any artery, or of the heart itself, not even after the most violent exercises, or in the greatest heat of fevers, to which she is very liable, has been perceiv'd.

10. The nearest disorder to an asphuxia, is that of a very remarkable smallness of the pulse, join'd with weakness, sometimes from nature itself, but more frequently from disease. That this symptom was natural, I judg'd in a woman us'd to great exercise, and robust, who was troubl'd with a violent angina: for which reason I was by no means deterr'd by this pulse, though a young man, from ordering so much blood to be taken away, as the disorder requir'd. And the recovery of the woman prov'd to me, that I had not been deceiv'd, as I afterwards found in her, when she was in very good health, the very same kind of pulse, and ascrib'd it to the natural slenderness of the arteries, which lie immediately under the skin.

But when this pulse has been owing to disease, it has happen'd, that I found it quite different in different persons, as the histories which follow will, in part, demonstrate: I say in part, for those which give instances of the very great laxity of the fibres of the heart, are either already sent to you (*s*), or will be sent to you hereafter (*t*).

21. A man, of forty years of age, had a tumour, which grew under the skin that invests one side of the occiput, of the kind that is call'd *talpa*, and *testudo*. This tumour having degenerated into an abscess, at length carried off

(*q*) Vid. & Animad. 42. 43.

(*r*) Hist. de l'Acad. R. des. Sc. A. 1748.

(*s*) Epist. 11. n. 13. & Epist. 21. n. 49.

(*t*) Epist. 30. n. 15.

the patient. Never were there any complaints of the thorax, nor any difficulty of respiration. The pulse was neither very quick nor flow, nor intermitting, nor by any means, or at any time, unequal; and had only been deficient in this one circumstance, that it was weak, and very small. All which symptoms I was particularly assur'd of, upon enquiry, by the physician who had visited him very often, and who happen'd to be in the anatomical theatre at the time the man's thorax was cut into, and also examin'd the viscera of this cavity himself, while I was examining them.

The lungs coher'd, universally, with the pleura, were lax, and extremely foetid. The heart also, and its auricles, although the latter, in a somewhat less degree, had the pericardium attach'd to them all round about. The aorta, where it descended upon the vertebræ of the thorax, shew'd, here and there, considerable marks of a kind of incipient erosion, and still more of a future ossification, though smaller in their extent. No disorder, besides these, was observ'd in the thorax.

All the other parts in general, and amongst these the head, I neglected to dissect; not so much on account of the putrid smell, as from the necessity of dissecting a better body that was brought to me, in the mean while, in order to finish the public demonstrations of that year, which was 1727, and was now very far advanc'd, as to the season for dissection.

12. I could wish, now, that I had examin'd the inside of the cranium of this man, to see whether the cerebellum, which lay so near to the tumour and abscess, had any taint therefrom, that I might have compar'd it with what I have hinted above (*u*); not so much, indeed, in regard to the compression of the cerebellum in an asphuxia, as in regard to its being vitiated by the pus, which had penetrated through the caries of the cranium from the exterior abscess, in the manner describ'd above; or with those things which I wrote in another letter (*x*), of a woman who had her pulse very low, and her cerebellum very lax: although to you, perhaps, there will seem to have been found causes enough in the thorax of the man we are speaking of. But that the universal adhesion of the lungs to the pleura makes nothing to the present purpose, is demonstrated by a great number of other bodies, of which you will read even in my letters. And as to the strong and putrid smell of this viscus, it is better, perhaps, to account for it from the sanies, which had been carried thither from the abscess in the last days of his life, by the circulation of the blood, than to endeavour to account for the previous disorder of the pulse from this putrid and lax state of the lungs. Finally, there was a disease in that part of the aorta, from whence the arteries that go to the wrists do not proceed. It remains, therefore, to speak of that universal adhesion of the heart to the pericardium, from which you may suppose it to have happen'd, that the heart being constricted and confin'd within its covering, could expand itself less than it ought, in order to receive a proper quantity of blood, and consequently less than is requir'd, in order to push the blood forwards into the arteries; especially as I shall, hereafter, give you another history (*y*), in which, after a small and weak pulse, I found the pe-

(*u*) n. 7.(*x*) XV. n. 8.(*y*) Epist. 35. n. 12.

ricardium every where, though not very closely, connected to the heart; and as in the former letter (z), I took notice of Peyerus and Lower, both of whom observ'd a pulse of this kind in those who had the pericardium connected to the heart; that is, the latter a "weak" pulse, and the former, one both "small and weak."

Yet, on the other hand, we must not forget that Dionis, Freind, and Le Fay, whom I in that place equally commended (a), have mention'd, in a case of this kind, a pulse that was vehement and quick, and corresponding with the palpitation, which was great. It seems, therefore, that something else ought to be added, or not added, that the same cause, in appearance, may, at one time, produce this kind of pulse, and at another time, the kind of pulse which is quite opposite to it. But whether any thing was added, in the observations of those three very learned men of whom I spoke last, and what it was that was added, if any thing really were added, you will be able to conjecture from those things which have been already hinted in the examination of these observations.

There is, also, more than one passage in the illustrious author Senac, by reading over which attentively you may be better able to judge of the causes of pulses, which are diametrically opposite to each other; as, for instance, where (b) he shews, how it may come to pass, that with vehement and large pulsations of the heart, small and weak pulsations of the arteries are frequently join'd; yet sometimes both strong and large: or where (c) he teaches, and that even when there is no palpitation, why both the former and the latter kind of palpitations in the arteries are sometimes to be accounted for from the lungs: or finally, where (d) very clearly explaining all the doctrine of pulses, which, in regard to the several distinctions of pulse, you will not be sorry for having consulted; he deduces this distinction of weakness and smallness, which we speak of (e), not only from the force of the heart being languid, or from the small quantity of blood, but even from the resistance of the arteries being encreas'd, by reason of which they yield so much the less to the dilating force of the heart, as at the same time they are able to admit so much the less quantity of blood, on account of the same resistance (f). And he teaches that the resistance is encreas'd, at one time, by the too great plenitude, which leaves scarcely any room for farther dilatation, nor yet for constriction; from whence it happens, that in these cases the pulse becomes not only larger, but stronger also from blood-letting; and at other times, by reason of the coats of the arteries being contracted by the nerves, as particularly happens in hysterical women, when we perceive the arteries to be reduc'd to the size of a slender thread; and even the pulse, in some parts, is entirely suppress'd, from whence these parts are cold, at the time that the other parts are warm (g). And from hence, I suppose, you will be able to understand this circumstance; I mean, how *asphuxiæ* are at one time short, and at another time long, and mortal; and not only in hysterical women, but also in some other persons, in whom

(z) n. 17. & 18.

(a) n. 18.

(b) *Traite du Coeur*, l. 2. ch. 11. n. 9.

(c) l. 3. ch. 8. n. 9.

(d) ch. 7.

(e) n. 7.

(f) n. 5.

(g) ch. 9. n. 6.

there certainly does not appear any thing to account for it from, unless you account for it from the nerves, as in that observation which is given us by Starckius (b). But now let us return to my observations.

13: A middle-aged man, who was by trade a flax-dresser, came himself into the hospital of St. Mary de Morte, at Bologna, in the spring of the year 1705, complaining of a pain in the right hypochondrium: and, indeed, there was a tumour in that part, which resisted the hand of the person who touch'd it, and seem'd to be seated in the liver: but the pulse was very small, very weak, and very quick, and to the greatest degree so that I had ever met with it in any one even to that very day. About four hours after he came to the hospital, he was seiz'd with so violent a pain in the stomach, as he call'd it, that from the paleness of his face, his cold sweats, and his pulse being almost quite lost, and his respiration such as it generally is in dying persons, he seem'd just about to expire. He escap'd, however, and related to those about him, that he had been seiz'd with the same kind of paroxysm before, at several times. In the mean while, his pulse had return'd to the former state which I have describ'd just now. The day following, the physician order'd blood to be taken from his arm, and such things to be given internally, and applied to his side, as are generally us'd in tumours of the liver. A few days after, this tumour having by degrees vanish'd, behold the patient was seiz'd with a pain in the region of the heart, join'd with a difficulty of breathing. Blood was again taken away, but in small quantity only; which coagulated slowly, and in a small degree. From this blood-letting the respiration was made somewhat less difficult, but the pulse, at most, only a little better: for it had the same smallness and weakness, in proportion, in the temples as in the wrists; so that it could scarcely be found there at all. I applied my hand to the heart, and found that it beat with equal frequency, but with moderate force. And this pulsation was produc'd even far below the region of the heart, as one of the senior physicians thought, though I could not very well perceive it myself: I so far perceiv'd it, however, that besides the polypous concretions, and the quantity of water in the pericardium, which we had suspected before, I added the suspicion of the increas'd magnitude of the heart.

The heart seem'd quite to labour; and the patient himself petition'd for what are commonly call'd cordial medicines. At length, on the eighth or ninth day from his coming into the hospital, the same symptoms that I have mention'd still continuing, having begun to eat a roasted apple, as his appetite was now almost gone, and having just spoken to some persons who pass'd by him, he died of a sudden soon after, while he had as yet the apple in his hands: which Hippocrates (*), as you very well know, has said will happen to those who "have frequent and violent swoonings without any manifest cause."

Having observ'd the body to be here and there livid, but especially the face, and the adipose membrane to be yellowish, we open'd the thorax, and hasten'd to inspect the pericardium. And in this cavity was a great quantity

(b) Eph. N. C. Dec. 3. A. 10. Obs. 171.

(*) S. 2. Aph. 41.

of water of a yellowish colour; but the heart was, of all the large hearts I had seen, together with its fat, the most unsightly to look at. In it were three polypous concretions, made up of a kind of yellowish mucus, but not very soft, the largest of which was in the right auricle, and the others in the ventricles; and from one of these cavities a polypous concretion was produc'd into the pulmonary artery, and from the other into the aorta; so that there was not one of all our suspicions of which we saw reason to repent. However, there was some portion of the blood also black, and concreted into coagula; but the greater part was fluid as water: which we particularly observ'd when we dissected the pulmonary and the other large vessels. And we had before look'd upon the small vessels which are carried through the surface of the lungs, which were black, not very small, and distended with blood; the substance of this viscus, in the spaces betwixt these vessels, being whitish, except the upper part of both lobes, which was both internally and externally black, and extremely hard besides; and from thence, when cut into, there flow'd out, on all sides, a thickish ichor, of that colour which, in our country, is commonly call'd tobacco colour.

At length, the belly being open'd, in order to find out what had been the occasion of the pain and tumour in the right hypochondrium, we found the liver to be hardish, and every-where variegated like marble; and having not only small white spots, but also spots of the colour I spoke of just now: and although, upon lifting up this viscus, we found the part of the pylorus and duodenum which was contiguous to the gall-bladder, of a yellowish colour; yet the bile, nevertheless, with which this vesicle was distended and dilated, of itself resembl'd ink; or, at least, we saw the coats of it to be externally blackish, and internally to be already quite black.

14. It might happen, that this colour of the coats were less from the bile than from the inflammation of the gall-bladder, which had already degenerated into a gangrene: and if it were so, you have a clue from whence to understand the more clearly the cause of that pain which, in the beginning, had infested the right hypochondrium: although you might account for it from the mere distraction of the dilated vesicle; and from the same dilatation, which, perhaps, had been greater at that time, or join'd with flatulences in the subjected intestine, you might, perhaps, equally account for the tumour that had then shew'd itself.

But whatever there was of disorder in the upper part of the lungs, you will suppose to be of a more ancient date; especially if you call to mind what was the occupation of this man, and what consequences I have seen therefrom (*i*) in another man. Wherefore, if we set aside those polypous concretions, according to our present custom, which I believe is not by any means injurious to truth, these two things only will remain; a great quantity of water in the pericardium, and the increas'd magnitude of the heart; from which you may deduce the state of the pulse, such as has been describ'd, and those circumstances which by intervals afflicted the heart, and consequently disturb'd the respiration.

As to that water, you not only have in the Sepulchretum the sixteenth ob-

(i) *Epist.* 7. n. 13, & 14.

servation of the section which relates to the present subject, in which observation, although you will read that other things, and those of great importance too, were observ'd in the thorax, where it is given more at large (*k*), yet the weak and creeping pulse is deduc'd from the pericardium being full of water; and you will also find, in the sixteenth letter that I sent to you, many things which seem to agree therewith; as in the man (*l*) who had a weak and low pulse, the pericardium was distended with water; as in the boy and in the man whom Vieussens dissected (*m*), and who had labour'd under this disease, the pulse had been weak, small, quick, and finally, as in those dissected by Diemerbroeck (*n*), languid; which is confirm'd by those who do not doubt, but that the fibres of the heart must be relax'd by that quantity of water which lay round them: nor will you suppose it to be an argument to the contrary, that the same author then found the pulse at the same time more rare, since Diemerbroeck himself confess'd, that the heart may be irritated by an acrid water, such as the yellowness of this found in the man of whom we speak, prov'd it to be; and that from thence a quickness of pulse may arise. To these add the observations of Albertini, which we have already referr'd to (*o*); who mentions that the pulse was frequent and small, and indeed extremely small, very-quick, or faltering, in proportion to the greater or lesser quantity of water in the pericardium. And he supposes, that it is small, and pretty quick, but at the same time tense, and chord-like, where there is a water of a vellicating quality. But he there speaks of the dropfy of the pericardium, when it is the sole disorder with which the patient is troubld. And we had this disorder join'd with that enlarg'd state of the heart, which I shall consider presently. Nor would I have you be disturb'd, either that in other letters, and particularly in those where I treated of the peripneumony, I have describ'd a far different kind of pulse as being sometimes join'd with that quantity of water; or that, in the sixteenth letter, I did not admit a small and weak pulse among the particular signs of a dropfy of the pericardium. For in that letter I enquir'd after the signs which invariably distinguish this disorder from all others; in which number that this kind of pulse is not, plainly appears even by what was just now quoted from Albertini.

And in the other letter, such a dropfy was for the most part describ'd by us, as had not been of long, but of short continuance, and which, therefore, could not sufficiently have relax'd and weaken'd the fibres of the heart; whereas, in the man at present spoken of, who had been so long before subject to the paroxysms I have describ'd, and who had brought with him into the hospital such a pulse as I have related, the dropfy seems to have been of a long standing, as well as the enlarg'd state of the heart.

15. Nor does it escape me, that a vehement and chord-like pulse has frequently been join'd with an increas'd magnitude of the heart; that is, when there was nothing which obstructed it; as in the old man (*p*), whose history I have given you from the papers of Valsalva; and in the man also (*q*), and

(*k*) L. 2. S. 1. Obs. 88.

(*l*) N. 40.

(*m*) N. 24.

(*n*) N. 23.

(*o*) Comment. de Bonon. Sc. Acad. Tom. 1. in Opusc.

(*p*) Epist. 17. n. 6.

(*q*) Epist. 18. n. 30.

in the old woman (*r*), whose histories I have sent to you before, as describ'd in my own papers. However, in neither of the former did the pericardium contain water by which the fibres of the heart were relax'd; and the heart of the man had the parietes of its ventricles very thick. And this circumstance being found in the heart of the old woman also, it is not so much to be wonder'd at, if the more internal fibres of this viscus could not have been weaken'd by the great quantity of water which lay around it. On the contrary, in another man taken notice of by Valsalva (*s*), as the heart was indeed large, and surrounded with a great quantity of water in the pericardium, but the parietes of it were not very thick, as he has remark'd, so the pulse was scarcely to be perceiv'd: and this man, like the other, to whom the present discourse relates, died suddenly likewise. For what can a heart so much enlarg'd do, when the fibres of it are weaken'd, but admit a greater quantity of blood than it is able to expel? It must, therefore, necessarily be fill'd, and consequently become still more relax'd. And when it is more and more relax'd, it will throw out a less quantity of blood into the arteries, and with less force, from whence the smallness and weakness of the pulse will arise. But the laxity of the fibres of the heart, even when not macerated in the water of the pericardium, may sometimes be so great, that not only the heart may, by degrees, acquire an enlarg'd state, but that no pulse at all can, at length, be perceiv'd. And this happen'd in that young man describ'd in the latter end of the twenty-first letter, whom I have also taken notice of above (*t*). The observations of which young man, and, in like manner, of the man of whom I have spoken of thus far, I refer'd to when I told Homobonus Pifo (*u*), a professor of this university, "that I had seen an enlarg'd state of "the heart together with a slender pulse."

16. In an old man, who was of a lean habit, and whom I dissected in the month of December of the year 1743, the pulse had been weak and small, but not intermitting, when, on account of an *incarcerated hernia*, as it is call'd, he was brought into the hospital at Padua. And notwithstanding it was out of my power certainly to inform myself, whether the pulse had been in that state before this disorder came on, or whether it was rather brought on by this disease, join'd with an inflammation of the intestines, to such a degree, that a speedy death prevented any method of cure being attempted; yet the appearances which I observ'd in many parts of the body, and particularly in the heart itself, and demonstrated to a very crowded circle of students, are of such a nature, that I cannot judge them to be unworthy of being communicated to you.

As I examin'd the external surface of the heart, the left coronary artery appear'd to have been chang'd into a bony canal, from its very origin to the extent of many fingers breadth, where it embraces the greater part of the basis. And part of that very long branch, also, which it sends down upon the anterior surface of the heart, was already become bony to so great a space, as could be cover'd by three fingers plac'd transversely. For which reasons, a passage was open'd on both sides, not through a membranous canal,

(*r*) Ibid. N. 28.

(*s*) Epist. 16. n. 6.

(*t*) N. 7.

(*u*) Vid. ejus Specileg. Curation. S. 4. Obs. 1. in fin.

or one which was made somewhat hard, here and there, by disjoin'd bony lamellæ, but through a continued bony tube, which for hardness might with justice have been compar'd with any other hard bone, except that in some places it was less hard; though those were very small, and inconsiderable, and resembl'd the transverse lines form'd by the knots of a slender reed. The heart then being open'd, and some polypous concretions being taken away, although I saw the tubercles of the valves of the great artery much harder than usual, and almost bony; yet I found nothing bony either in them, or in any other valves, or in that artery near the heart. But at some interval from the heart, and at the origins of the upper arteries, and from thence downwards quite to the division into the iliacs, the internal surface of the aorta was frequently unequal on account of very hard bony laminæ, many of which equall'd in bigness the nail of a man's thumb: yet I found the thin internal membrane, by which all these ossifications were cover'd, to be hurt only in one place, a thickish kind of humour showing itself there; in regard to which, and the seat itself of these laminæ, I shall have a more convenient opportunity of speaking hereafter (x), and telling you what I observ'd in this man, and in others. And bony scales were not wanting, either at the division into the subclavian and carotid arteries, on the right side, or in the iliacs, nor yet in the splenic in particular, in which they were found very thick, quite to the spleen. Nevertheless, within the cranium, and in like manner, both in the upper limbs, and in the lower limbs, I observ'd nothing bony in the arteries; although this class of vessels was, in the limbs, more firm and hard than usual, and perhaps even somewhat wider than they generally are: and while I was cutting into these arteries, I saw that the blood which remain'd in the crural vessels was not fluid indeed, yet not polypous.

But in the lateral sinusses of the dura mater were polypous concretions, of a pretty considerable thickness. And in the right and left ventricles of the brain water was not wanting, nor hydatids in the choroid plexus of both; and among these some of a pretty large size.

But to return to the thorax and belly: I observ'd, when I cut into the aspera arteria, and the first of its branches, that the cartilages were in several places become bony; and that the same cartilages were, in the trunk of that artery, reduc'd to such a form, that each of them, rather than being in the shape of one curv'd line, as they us'd to be, resembl'd the two sides of a triangle, which met and form'd an angle anteriorly: on which account I remark it here; for it is not very uncommon that these cartilages, and those of the larynx, should become bony in old men, as appears by the observations collected from many authors by the celebrated Winkler (y); so as to make it rather remarkable that Casselbohmius, who was, when living, a very experienc'd anatomist, should never, as he himself relates it, have seen them become ossified: for I have certainly seen both the one and the other in a state of ossification more than once (z).

And in the belly, although besides inflam'd intestines, as I said in the beginning, it had all the viscera in a sound state, and amongst these the liver

(x) Epist. 27. n. 22.

(z) Epist. 7. n. 11. & Advers. Anat. l. n.

(y) in calce Diff. de vasor. hum. Lithiasi. 24.

and the spleen, both of which were of a moderate magnitude; yet in the liver these things were to be excepted. The gall-bladder was plac'd transversely: and although even that was of a proper and natural size, it had not form'd the least bed or sinus for itself in the liver, into which it was, according to its usual custom, receiv'd; so that after I had disjoin'd its fundus from the liver entirely, which I did without the least force or trouble, the situation to which it had adher'd, could scarcely be known; and the surface of the liver, in that part, was so smooth and uniform, that if there had been any small vessel, of any kind whatever, going from the liver to the fund of the vesicle, or from the fund of the vesicle to the liver, it must necessarily have been of an incredible smallness, so as entirely to escape all notice of the senses. And in this state had the gall-bladder been quite from the original formation. But in it was contain'd a blackish and viscid bile, in a small quantity, in which were calculi to the number of twenty. And seeing these calculi to be black, I immediately predicted, to those who were present, what did in fact happen, that they would neither take flame, nor be melted; and when applied to the flame, that they would scarcely give the slightest cracks. They were all of a small size, and nearly equal in their magnitude: and all of them consisted, as it were, of many globules, which being plac'd upon one another, were contiguous to each other, on their smaller surface.

Last of all, I inspect'd the scrotum also, from whence an intestine had been withdrawn a little after the man's death, when I was absent, and remov'd, together with the others, that the body might keep the longer. I found that the testes which had been nearest to the hernia, was considerably less than the other. Being cut into, it had the internal substance of a brown and reddish colour, whereas the other had it of a natural colour. Yet betwixt this and the tunica vaginalis was a small quantity of water; nor was that prominent corpuscle wanting at the other extremity of this very testicle, of a roundish figure, which I have also observ'd on a former occasion, and taken for the remains of a ruptur'd hydatid (*a*).

17. Reserving many things out of this dissection to another place, to which they more immediately belong, I shall here add a few things upon the subject of that coronary artery being bony.

Laurence Bellini (*b*) says, "I have seen a stone growing to the larger branches of the coronary artery, where they divide the right from the left ventricle." Whether, with Pechlinus (*c*), he distinguish'd the nature of bone and stone in the rigid indurations of the vessels and membranes, or whether he comprehended all under the term of stone; as when a little lower, in making mention of the indurations in other arteries, and in the valvula mitralis, which he had seen, he makes use of the same term of stone; for it is very difficult to suppose, that he had never lit upon bony laminæ, but always upon stony concretions; so that in regard to the present question, the thing amounts just to the same; for how far that distinction, betwixt bony and stony formations, may take place, I shall take particular notice hereafter (*d*). They who have given the observation of their preceptor Drelincurt,

(*a*) Epist. 21. n. 19.

(*b*) De Morb. Peet.

(*c*) Eph. N. C. Dec. 1. A. 9. & 10. Obs. 31.

(*d*) Epist. 25. n. 9. & Epist. 27. n. 20. seq.

in the first book of the *Sepulchretum* (*e*), have spoken in the same manner as Bellini; and Drelincourt, in the same body in which he found, as I did, “the splenic artery here and there protuberating and tophaceous,” found, “also, the coronary artery of the heart stony.” But Thebesius says, that he had seen (*f*) “the larger branches of the arteries --- which run down upon the convex surface of the heart, quite to the apex, partly ossified in several places.” Finally, the celebrated Crellius has publish’d an observation, accompanied with scholia, very worthy to be read, “of the coronary artery of the heart being harden’d like bone;” that is to say, the same which was afterwards found to be so by me, the left, and equally from its origin, and in its most considerable branch, besides.

I wish we could know, as we have it in the second book of the *Sepulchretum* (*g*), what disorders, and what kind of death, had preceded in the man, in whom the coronary veins of the heart were found to be bony, although not without other disorders of the internal parts; I wish, I say, we could know, in like manner, what peculiar inconveniences had been felt by those in whom the corresponding arteries were bony; since Lancisi (*h*) has suppos’d, that nature had wrapp’d up these arteries in little bundles of fat, in order to take care, that they, when harden’d into a bony substance, in the same manner as other arteries frequently are, “might not be prevented from a free distension and elongation, when there was need.” But neither Bellini, nor the disciples of Drelincourt, have added any thing in regard to the foregoing disorders: Thebesius has suppos’d, that this circumstance might be “extremely fatal;” but that it was so he has not said: Crellius could not so much as see the other part of the body of the old man, in whose shrivell’d and already half-rotten heart he observ’d this appearance: and finally, I had it not in my power to learn any more circumstances than what I have given you, in relation to this very poor man, who had nobody to take any farther care of him, than to see that he was carried into the hospital, a little before his death, notwithstanding I took a great deal of pains, and was extremely desirous to know.

At length, when I read these things over again, and look’d into the several observations that are extant, by the most famous men, of this very disorder of the heart; first by Senac (*i*), secondly by Plancus (*k*), and last of all by Haller (*l*): I observ’d that the first and the second were taken from men who had been subject to a palpitation of the heart. But although in the second, as I have before related (*m*), other evident causes of palpitation were not wanting; yet the first, particularly, shew’d from whence this palpitation had arisen, at least in that case, as it did not exhibit the least appearance of disorder, except that of the coronary arteries being become bony, and forming branches like the branches of coral; so that it was very easy to understand, whether some of the ossified branches of these vessels pass’d down between the fibres of the heart, or whether they remain’d on the outside, and

(*e*) Sect. 12. in Addit. Obs. 8. in fin.

(*f*) Disp. de Circul. sangu. in Corde, § 4.

(*g*) Sect. 1. in Addit. Obs. 31.

(*h*) De Mot. Cor. l. Propos. 39.

(*i*) Traite du Coeur, l. 4. ch. 9. n. 5.

(*k*) Epist. de Monstr.

(*l*) Opusc. Pathol. Obs. 50. & 51.

(*m*) Epist. 23. n. 9.

embrac'd these fibres; that either in one way or the other they must have irritated the fibres of the heart, either in the systole, or in the diastole; and by this means, according to what our author teaches in another place (n), have brought on a palpitation. Haller produces one or two observations made upon old women, in whom other parts had, likewise, degenerated into bone; but what inconveniences they had been troubled with when living, he does not say, I suppose for the same reason which prevented me from knowing any other circumstances in relation to my old man. And I was before not a little disappointed for a similar reason, that the same thing should have happen'd to me in regard to the pulse of a certain man, when, about the latter end of the year 1725, I dissected the greatest part of his viscera, which were brought home to me, while my friends inspected the dissection. However, what I heard, and what I saw, at that time, I will relate to you.

18. A man about six-and-thirty years of age, of a large stature, and who was servant to a miller, fell into a disease which seem'd to be a dropsy of the thorax. For which reason, his legs being swell'd, his pulse being very low, and a virulent gonorrhæa, moreover, afflicting him, he died.

There was not only water in the thorax, but in the belly also, as they who had remov'd the viscera related; and besides this, that the larger intestines were in some places inflam'd, and had a very strong smell, for which reason they had not been sent together with the other viscera. And that these circumstances were true, was confirm'd by the disagreeable odour of those which had been brought, particularly by the viscera of the belly, and not a little, indeed, by the viscera of the thorax. Wherefore, passing over the lungs, which were extremely heavy, I very accurately enquir'd into the state of the heart and the vessels, into which I happen'd at that time to be desirous of making some particular enquiries. Some whitish polypous concretions, some of which kind were also in the vena portarum and the inferior cava, being taken away from the right auricle, and no concretion of this kind being found in the other cavities of the heart, and no disorder appearing in any part of this viscus, or its vessels, except in the valves of the great artery, and that being very considerable, upon looking upon and examining it very attentively, I found it thus: All these valves, on the upper part of their border, and on the neighbouring part of that surface with which they look upon each other, swell'd out into short and unequal excrescences; by the load of which being weigh'd down, they were all brought so near together by this means, as to leave but a very narrow passage betwixt each other through which the blood might pass out. But when I examin'd each valve in particular, I saw that the right had its border much shorter than usual, or was become less transversely; and that the left was ruptur'd through the middle, from the border quite to the lower part; and that from the very lips of this rupture other excrescences were protuberant. The substance of all these valves was in part lax and flaccid, so that it might be very easily pull'd away by the fingers and by the nails; and yet it was partly harder than usual, also; so that when you rubb'd it betwixt your fingers, you would perceive some particles to be mix'd with it, which approach'd, in some measure, to the nature

(n) Ch. 11. n. 2.

of a cartilage. These excrescences being taken away, the substance of the valves remain'd, but was contracted and deficient, and confirm'd what had appear'd at first sight; I mean, that this disorder had taken its rise from a kind of erosion, especially as the internal surface of the ventricles, where it border'd upon the valves, shew'd itself also some marks of erosion. Having seen these things, and other preternatural appearances being look'd for in vain in the aorta and the other vessels, and in the whole heart itself; and the borders of the mitral valves being only somewhat thicker here and there than they generally are, and being at the same time observ'd to be harder than usual; I went on to examine into the remaining parts.

Some of the viscera of the belly had only these few things which were worthy of remark. The liver was large, and yet not to an immoderate degree, of a palish complexion; and in its whole external surface there appear'd a kind of brownish network, with which some very small and white spots were mix'd. The spleen, being internally soft, had on the external surface some thick adipose ramifications, as it were, if our eyes were to be believ'd; but the substance of them was of a tendinous firmness, and even of a middle nature betwixt a cartilage and a ligament. The glands in the centre of the mesentery, and at the trunk of the vena portarum, were enlarg'd.

When I call'd to mind the gonorrhœa, I was sorry that it had not been allow'd to bring the penis away with the viscera. I examin'd, therefore, with the utmost diligence, the beginning of the urethra, the prostate gland, and the vesiculæ feminales. The urethra, in the part of it which I had in my power to examine, was without any mark of disease; however, the feminal caruncle was low. The prostate was small. In the vesiculæ was a watery semen; but as the patient had been dropical, this was, perhaps, less to be attended to.

19. This observation of mine upon excrescences in the semilunar valves, holds, in some measure, a middle place betwixt that extraordinary observation of Lancisi (*o*), who saw fleshy excrescences in them, and the other less extraordinary observations of Cowper, in particular, and Vieussens, who, as we have also taken notice in the former letters (*p*), have seen them bony or stony. For which reason it were more desirable for me to know, if it were possible, whether the man of whom I speak had ever been accusom'd to have an intermitting and unequal pulse, as these gentlemen observ'd in their patients; or, as Lancisi found it in his, for the most part, regular and equable (*q*). But, as I have already said, I could learn nothing else but that it had been very low; which in other respects agrees very well with that small quantity of blood which of course enter'd into the aorta through the passage that was so much streighten'd by the valves: nor does it disagree with my observations on the old woman and the old man, the first of which I gave you in the same letter (*r*), and the latter in the twenty-first (*s*). For as the semilunar valves of both were bony, and in the woman were beginning to thicken on their edges into considerably large tubercles, and in the man were

(*o*) De Subit. Mort. l. 2. Obs. Phys. Med.

(*q*) Vid. § 10. Schol. ad. cit. Obs.

4. § 3.

(*r*) 24. n. 11.

(*p*) N. 9.

(*s*) N. 15.

even more protuberating internally than usual; so the pulse in both was weak; and that of the woman, moreover, small; but in neither of them intermitting.

20. Now that mention is made of the intermission of the pulse, which approaches more nearly to the nature of an asphuxia than even their slenderness or weakness, (for what else is the intermission of the pulse but a very short asphuxia, or what is an asphuxia but an intermission which lasts very long?) the causes of this disorder in the pulse are not to be pass'd over without examination in this place, as the greater part of physicians are very greatly terrified thereby, often with good reason, yet frequently without any; as when there is some cause of it in the stomach or intestines, which may either vanish away of itself, or be easily remov'd by the physician. For in what manner a palpitation of the heart may be sometimes brought on by flatus distending these parts, and again carried off by the dissipation of such flatus, I have already said (t); and in the same manner, or one not very dissimilar, it is also evident, that an intermission of the pulse has been sometimes generated, and gone off of itself, in many whom I have known. At another time, in these very same viscera, there is a matter which produces the same effect, by irritating their nerves, with which you know how easily the nerves of the heart consent. And this matter is sometimes of such a nature, that it may readily be prevented from harbouring itself there. Thus I remember, when I attended to the cure of a virgin, who had a fever, and an intermission of the pulse was added to the other symptoms, contrary to my expectations, I was not at all deter'd from giving such a medicine as I had before determin'd upon, that the stomach and intestines might be well cleans'd; and even that I gave it so much the more boldly; and that on the same day, after these parts had been deterg'd, the pulse return'd to its former standard. But you will read, even in the *Sepulchreum* (u), that *Ballonius* had not only seen this disorder of the pulse, but also that of a languid and small stroke, remov'd in the same manner. "According to the degrees to which the "purging was carried," says he, "the pulse was restor'd." And, indeed, there is an intermission of the pulse that is of a far longer continuance, as that with which *Lancisi* says he had been troubl'd "for the space of six years (x);" yet if this intermission should be, as it was in him, "from a "consent with the hypochondria," it may be entirely and perfectly taken away, by perfectly restoring those parts.

And in regard to what I have said of the nerves which are irritated in the hypochondria, the same cannot be denied of the nerves in any other part, or from any other cause, if dispos'd in the same manner as these. This was extremely evident to me in a certain very experienc'd and judicious professor of physic at *Bologna*, who having happen'd to observe that his pulse intermitted, and being very anxious and solicitous for that reason, as if it were impossible it should happen from an accidental cause, was every now and then, as is generally the case with men of physical science, applying his fingers to his wrist, and perceiv'd, with very great grief to himself, that the intermission was continually increasing: yet the very same gentleman, after having not

(t) *Epist.* 23. n. 16.

(u) *Sect.* hac 9. in *Schol.* ad *Obs.* 8.

(x) *De Subit. Mort.* l. 1. c. 19. § 3.

disdain'd to take my advice, though a young man, which was to apply his fingers to his pulse much less frequently; and having, in consequence thereof, less increas'd the anxiety of his mind upon the occasion, the intermission soon became much less observable; till at length, by not attending to it, it entirely vanish'd away.

But I learn'd from a patient, that not only those nerves which go to the heart, but even those which are subservient to the arteries or muscles that lie near them, may also vary the motion of these arteries; for this patient, having but just escap'd the danger of a most violent disease, was affected with a very great sadness, on account of unfavourable news that had been brought to him unseasonably; and this sadness was so much the greater, in proportion as he endeavour'd to conceal it: and I found his pulse, at a time when I expected no such thing, at first in both the wrists, but on the following days in the left wrist only, to labour under all kinds of irregularities, so as to make it very evident, as the pulse was extremely equal at the same time in the right arm, that the cause related only to the left brachial artery; which did itself also soon after return to its natural motions when the grief was alleviated, and the nerves were brought back to their former disposition.

21. Yet when there is an intermission of the pulse which does not arise from an impediment, or irritation, in any other part, but from a cause which has its origin in the heart itself, or in the neighbouring trunk of the great artery, or in both; then, indeed, I must confess, it becomes a symptom of importance, and we are under a necessity of considering it as such. And this cause may be manifold and various; and among the first may be that very constitution, or state, of the femilunar valves which was just (y) now spoken of. For I am not inclin'd to be careless what has happen'd to others, because it has happen'd differently to me. And I even attend to that which I consider as a still more important cause, and what Gregorius Horstius and Laurence Bellini have observ'd. For the former, as you see in this ninth section of the Sepulchretum, and will read at large, not in the following section on the syncope, but in the preceding section on palpitation of the heart (z), saw a calculus, similar to a pretty small chestnut, growing to the membranous substance of the valves of the right ventricle of the heart; and Bellini saw a stone which had been generated in one of the valvulæ mitrales, both of them after an intermitting pulse: which observations I have even taken notice of in the former letter (a). Yet Horstius (for Bellini promis'd that he would give us his observation more at large on some future occasion) found at the same time a putrid humour in the pericardium, and the heart enlarg'd to double its usual capacity. And even Cowper and Vieussens, as is said in that same letter (b), for the most part, found in those who had had intermitting or unequal pulses, besides a bony or stony hardness of the valves, a dilatation of the left ventricle of the heart. But it accidentally happen'd, that although I saw the valves thus chang'd, I did not at the same time find an enlargement of the cavities of the heart: and in like manner it happen'd, that when I found this enlargement by itself, the pulse was not intermitting.

(y) N. 19.

(z) Obs. 25. §. i.

(a) N. 9. & 13.

(b) N. 9. & 10.

which

which the eighteenth letter will particularly shew (*c*); or if in one man (*d*) they had been intermitting, yet there were other things at the same time, which, perhaps, might be accus'd with justice of contributing thereto: and you will see that it has happen'd nearly in the same manner to Valsalva (*e*).

What then are we to conclude? Will these causes, which, when separate from each other, are always unable to produce an intermission of the pulse, be always, or almost always, able to produce this symptom, when they are join'd together? As, in order to discuss these points properly, a much greater number of observations are requir'd, it will be sufficient at present to have pointed out those things which do not always answer.

†2. I see also, that in this section of the Sepulchretum (*f*), that cause of an intermitting pulse of which I have already written so largely in the former letter (*g*), is produc'd; I mean, the adhesion of the pericardium to the heart. And that this adhesion, certainly, does not always produce that symptom, I have likewise sufficiently confirm'd in the same letter (*h*).

Ulcerations of the heart are also produc'd here (*i*). Yet whether with these there are always intermitting pulses, I shall enquire in the next letter (*k*); as I shall likewise equally enquire, whether swoonings or syncope are always join'd with those exulcerations.

But now I shall particularly attend to one cause, passing by these and others that are not so frequently accus'd; which one cause is generally mention'd more often than any other by physicians, when the question is of intermission and inequality of the pulse; I mean the polypus. And some persons are not wanting, who would make us believe, that this had been known to Galen, inasmuch as he describes its "conformation from a great "number of pellicles" in a cock, as if he were not there (*l*) expressly speaking of "the coat of the heart being affected with a scirrhus tumour, "just as if many thick membranes had been wrapp'd-up one over another." Certainly they would have asserted less improbable things, if they had affirm'd, that when he judg'd the disorder of Antipater (*m*) to be from an obstruction of the smooth arteries of the lungs, by "thick and viscid humours," he had conceiv'd an idea, in his own mind, of something like a polypus. At least those circumstances which are said to arise from a polypus of the heart, Galen accounted for, from that cause which he had conjectur'd; that is, first, "inequality of all kinds in the pulse;" and after that, in the progress of the disease, "a palpitation of the heart, and a difficulty of breathing;" and finally, a sudden "death:" or Salius (*n*), without a doubt, attributed these symptoms to that cause, following the same conjecture, and added to them "a kind of dropy and swooning." But the first who really found polypi in the veins, not in conjecture only, but with his eyes and his hands, as far as I remember to have read, to this time, seems to have been my fellow-citizen Helidæus de Paduanis, a very celebrated physician in his time; so that if Schultz were living, and I would to God he were, he could, perhaps,

(*c*) n. 2. 28. 30.

(*d*) Epist. 21. n. 34.

(*e*) Vid. Epist. 17. n. 21.

(*f*) Obs. 15.

(*g*) n. 17. & seqq.

(*h*) n. 11. (*i*) Obs. 11. & 42.

(*k*) n. 19. & seqq.

(*l*) De loc. aff. l. 5. c. 2.

(*m*) De iisd. l. 4. c. 8. in fin.

(*n*) De Affect. Partic. c. 21.

no longer believe he had reason to repent, that "he had deduc'd, without " sufficient reason, the beginnings of this doctrine from Italy (*e*). For Spigelius has said (*p*), that Helidæus found, in the body of a person who died of a long-continu'd quartan, " large, long, white, and pituitous concretions in the heart, the veins, and all the limbs." Nor yet did Helidæus live in the same age in which Spigelius flourish'd, that is, in the seventeenth century; for this is one of the many typographical errors that are admitted in the work of Pissinius (*q*); but in " the past century," as Spigelius had rightly said, that is, in the sixteenth; and even Petrus Forestus, who died before the end of the same sixteenth century, in an extreme old age (*r*), has pretty clearly pointed out, how long before Helidæus had begun to flourish, when he speaks of him in this manner (*s*); " Helidæus, a very eminent " physician, and my preceptor," whom I should also assert to have first observ'd a polypus in the heart, if that " little piece of blackish flesh," found before by Benivenius (*t*), in the left ventricle of the heart, above the artery, in the shape of a medlar, after a pain of the heart and swoonings, were not taken by most persons for a polypus; in the same manner as " the two pounds " of glandular, but at the same time blackish, flesh," found afterwards by Vesalius (*u*), in the same ventricle, which was dilated like the uterus, after a pulse which was surprisingly unequal and various: although Donatus (*x*) reckon'd both these pieces of flesh, as they are call'd, without any hesitation, among the number of " fleshy excrescences" of other parts which he was describing, just as Schenck (*y*) did among " the fleshy excrescences of the " ventricles of the heart:" and Riolanus (*z*) has distinguish'd " a remarkable " gland," which the heart of a certain Polander " had on the middle of its " septum," from polypous concretions; and our Faſta (*a*) wonders, as he finds no other observations of blackish polypi being contain'd in the left ventricle, in the whole Sepulchretum, how those two polypi of Benivenius and Vesalius, which were in that ventricle, should be black.

23. But whether these two bodies were, or were not, polypous concretions, though there is, perhaps, little or no room to doubt it; they certainly were, as I have shown in another place (*b*), which were found by the physicians in the year 1557; one under the appearance " of a flesh-like substance," and about this another, " which resembl'd melted hog's lard;" and not only these, but those also which were extracted by Coiterus (*c*) from the sinusses of the dura mater, and from the ventricles of the heart of a phrenetic woman, and at other times, from the brain of those who had been kill'd by hanging; all these being " not unlike worms, but made up of a white pituitous matter."

And as this author had begun, even from that very time, to admonish physicians to be cautious, as it seem'd to him that they had been impos'd upon

(*e*) Epist. add. ad Goetziū dissert. de polypos. concret. &c.

(*p*) De Febre Semit. l. 1. c. 15.

(*q*) Epist. de Polypo. Cord.

(*r*) Vid. Freher. Theatr. Viror. erud. cl.

P. 3.

(*t*) l. 1. Obs. Med. 12. in Schol.

(*u*) Sepulchr. l. 2. S. 10. Obs. 6.

(*a*) Ibid. Sect. hac 9. Obs. 2.

(*x*) De Med. Hist. Mirab. l. 5. c. 3.

(*y*) Obs. Med. l. 2. ubi de Corde.

(*z*) Anthropogr. l. 3. c. 12.

(*a*) Epist. de Cord. Polypo. n. 14.

(*b*) Epist. 17. n. 2. & 29. & Epist. 4. n. 23.

(*c*) Observ. Anat.

by concretions of this kind, who affirm'd that they had found worms, either within the heart or the cranium; we cannot be sufficiently astonish'd that the admonitions of this very great man were neglected to such a degree, or so buried in oblivion, that those things which we read in the *Sepulchretum*, to go no farther, and which are the productions of writers in other respects learned, should be deliver'd down to posterity in the manner they are. For you will read, for example's sake, the younger Vidiſius (*d*) asserting, that he had heard from men who deserv'd to be credited, and who had dissected persons carried off by pestilential fevers, "that worms had been sometimes generated in the ventricles of the heart." But you do not read that he had made any enquiry from them, what kind of examination they had made use of, and how they had distinguish'd real worms from concretions which had the shape of worms. You will read that Spigelius (*e*) had found, in a woman who died of a consumption, "four round worms, of the length of a span, which had insinuated themselves into the very trunk of the vena portarum, and had been an obstruction to the entrance of aliment into the whole body." But, although you will indeed find this observation in Spigelius himself (*f*), yet you will nevertheless see, that he did not make it in the year 1562, in which he was not yet born, but in the year 1601, in which he had scarcely, perhaps, completed his three-and-twentieth year; but by what method of distinction he found out that they were real worms, you will see that he says not one word. You will rather wonder that he should have believ'd them to have come thither from the intestines, "through the narrow orifices of the meseraic veins," and that they "had remain'd there so long as to obstruct the passages of the aliment." For although other worms have sometimes perforated the intestines, as I have also seen in a hen (*g*), when dead; yet by what sort of ingenuity or instinct these creatures selected the orifices which he mentions, and went through them, and liv'd so long out of their natural situation, in one which was quite foreign to them, and by this means "were an obstruction to the entrance of the aliment into the whole body," does by no means appear. On the other hand it appears, that no difficulty of this kind remains, if you suppose that there were four polypi, which resembl'd worms, especially as they are very frequently met with in the bodies of consumptive patients.

But what shall we say of that little snake which Zacutus (*b*) and Severinus (*i*) have suppos'd to be found among the English, in the left ventricle of the heart? Why truly nothing, but what I have already signified in the former letter (*k*), when I happen'd to fall accidentally upon the same subject; I mean, that it was sufficient to have read the description, in order to be convinc'd that it was a polypous concretion. For which reason, even Severinus (*l*), although he first said quite different things of this little snake, and amongst these, something which has come even into the head of a certain person of our age, in order to explain the generation of polypi, I mean, that they were rather in the class of vegetable than animal productions; yet after-

(*d*) l. 4. S. 1. Obf. 62. §. 11.

(*e*) l. 2 S. 7. Obf. 163.

(*f*) De Lumbr. lato, c. 5.

(*g*) Epist. Anat. 14. n. 44.

(*b*) (*i*) Sepulchr. l. 2. S. 4. Obf. 6. §. 1. & 2.

(*k*) n. 15.

(*l*) in Schol. ad cit. Obf.

wards he comes with justice to this point, to suppose, viz. that they rather belong to the class of those concretions which he himself had even seen, and which now we call polypous concretions. And if Riolanus had not read this author, or if he himself had not also seen concretions of this kind; I should much the less wonder at his using in his *Encheiridion* (*m*) the following words; "Worms are also generated in the heart: - - there is a remarkable history of a certain Englishman, whose heart was gnaw'd by a worm: you will read the history in the works of Aurelius Severinus." Finally, as we have already spoken in the last letter (*n*), of another worm under the form of a fly, of which the same Zacutus had written, you will see added under the same observation, when repeated in another place by Bonetus (*o*), a second observation (*p*), of two worms, which a man, in other respects learn'd, show'd to those who were present, being envelop'd in black and grumous blood, with which the ventricles of the heart were occupied; both of them of a white colour, half an inch long, and furnish'd not only with a proboscis, but with ears and eyes; such, I suppose, as they us'd in that very dark place, unless you can believe it was at that time surrounded with a kind of vital flame!

Both of them, however, were dead, or rather, had never liv'd, as I suppose; and were only a kind of polypous filaments, which grew slender at one end, and form'd themselves into a kind of proboscis, with particles of blood adhering to them, as generally happens, which look'd, in some measure, like eyes and ears.

But you will reply, that the worm which was found by the physicians in the pericardium of a certain Florentine, who had been carried off by a sudden death, was still "alive." Who says so? Petrus Sphererius (*q*). Was he himself present? It does not appear that he was. Was he who related it to him? Not even that.

I resided at Bologna, at a time when a rumour happen'd to be spread about, that upon dissecting some horses of a nobleman, which had fall'n down dead suddenly, lizards, which are a species of many-footed animals, were found in their hearts. The learn'd laugh'd. Yet some half-learn'd persons were not wanting, who contended, partly, that there might have been so; and partly added, by way of confirmation to the report, that these lizards had been found to be not quite destitute of life and motion. To these Valsalva replied, What need have we of dispute? Let us examine these lizards. Another horse, therefore, having died in the same stable, and in the same manner, we examin'd the carcase of the animal; nor did we need any very long examination, in order to perceive very plainly, that they were nothing else but polypous concretions, which, in some measure, resembl'd lizards in their external form.

Do you think it was destin'd, then, to those times, by some kind of fatality, that worms should be found in the sanguiferous vessels, and the heart? or do you not rather imagine, that if the admonitions of Coiterus had not quite slipp'd the memory of our ancestors, they would have found worms,

(*m*) l. 3. c. 8.

(*p*) In Schol.

(*n*) n. 15.

(*q*) Obf. cit. §. 1.

(*o*) l. 2. S. 11. Obf. 3. §. 2.

in places of that kind, no oftener than their posterity have done? But lest you should suspect, that it was purposely done of me not to recede from the observations which are given us in the Sepulchretum, either here, or where I treated of worms in the pericardium (*r*); I will just hint at the principal observations which either have not been related there, or could not be related there: and I will touch upon them in such a manner, that you may not only plainly perceive me not to be unmindful of what I then ingenuously confess'd; I mean, that I do not contend in regard to what I have frequently seen in dogs, that the same can never happen in human bodies, but also, that I shall not contest the point with you, if you should chance to believe that such a thing has really sometimes happen'd; as it might have happen'd in more ways than one. For if you, first of all, read those things which I have said (*s*) had been seen by me and by others in dogs, and in other animals, that there was more than one place in which worms, of a reddish colour, and of the slenderness of needles, are generated, and from whence they attempt an exit, and particularly into the sanguiferous vessels; you will not be extremely surpris'd that Thomas Cornelius (*t*) should have found, in a starling which had been troubl'd with convulsions, "a kind of small round worms twining about the basis of the heart;" and still less, that the eminent surgeon Lapeyronie (*u*) had, in more than one dog, seen worms conglomerated betwixt the basis of the heart and the pericardium, and sometimes even in the ventricles themselves. And if you suppose, that neither of these gentlemen was deceiv'd by any similitude or appearance of these worms, you will still less imagine, that Lochner was deceiv'd, when he (*x*) affirm'd that he found "small and redish worms moving themselves, and creeping about "in a surprizing manner," and, as he sufficiently shews by the example he gives (*y*), "in thickness and length to be compar'd with a small needle;" and these in the left ventricle of the heart of a little girl, in whom he describes tortures of two months continuance, and a sense of gnawing about the præcordia, together with a tremor and palpitation of the heart, an intermission of the pulse, swoonings, cold sweats, and convulsive motions.

It were much to be wish'd, indeed, that, before he pronounc'd the "nidus" of these little worms to have been in the heart, which is a viscus, by reason of its alternate constrictions, and those in consequence of irritation more vehement and strong, very unfit for worms to form their nidus and take up their residence in for the space of two months; it were to be wish'd, I say, that he had enquir'd after those erosions and indurations of the substance of the heart, which have been observ'd by us in nidusses of that kind, lest, perhaps, they should have been seated in the coats of some vessel not very far distant; so that the heart might be easily drawn into consent, and the worms might at length have pass'd on to the heart, at the time when worms always fly from their nidusses, where-ever they are; I mean, at the time of their death, or soon after, as has been observ'd by Vallisneri (*z*).

(*r*) Epiſt. 23. n. 15.

(*s*) Epiſt. Anat. 9. n. 44. & ſeqq.

(*t*) Progymn. Phyſ. 6.

(*u*) Apud Senac Traité du Cœur, l. 4. ch. 9.

n. 6.

(*x*) Eph. N. C. Cent. 8. Obſ. 1.

(*y*) Vid. Earund. Dec. 2. A. 6. Append.

n. 1. Obſ. 13.

(*z*) Riſp. alla Lettera di Monſign. d'Adria.

And this I suppose to have happen'd at that time in dogs also, and other animals; and still more readily where the question is not of other kinds of worms, but of the common round worms of the stomach and intestines being sometimes really found within the pericardium. Yet I do not suppose that they have gone through the sanguiferous vessels, in the coats of which these creatures do not form their nidus; but through the short and easy way of the œsophagus, which they perforate in the same manner as they do the intestines, and not very seldom neither; so that they can very easily penetrate into the neighbouring pericardium. By which way, and at the time I have said, I should suppose, that the worm of Baglivi, which Le Clerc (*a*) takes notice of, had come thither, and in like manner another, which the celebrated Hœhnius (*b*) says, upon drawing it away from the heart, to which it was fix'd, "immediately curl'd itself round his fingers like a snake." For this last worm was in a man, in regard to whom it is not said, that while he liv'd any symptoms of disorder relative to the heart were observ'd; and the first was found in a man who had labour'd under pains of the stomach, and other disorders which relate to the heart, indeed; but this might be easily drawn into consent by the stomach. You, therefore, understand my doubts and conjectures, which I shall not get rid of till a number of observations have been produc'd, which have not been taken without the most accurate examination, that I so frequently want, and which may at length bring me so far as to acknowledge readily, that the circumstance which I do not now pretend to say did never happen, or never may happen, has really happen'd. You see, at the same time, that where an author is worthy of credit, and says that living worms, either of the intestinal kind, or of others, were seen to be alive, I take it for granted that it was so, in deference to his testimony. But, in fine, how many observations of this kind are extant? For of those which I at present remember, I think there is not one that I have omitted here; and among them there is one, I think, of a worm not alive.

But Du Verney, you will say, is said (*c*) "to have observ'd" a worm like an earth-worm, and that living too, within the longitudinal sinus of a boy who had been troubl'd with a continual and violent pain at the root of the nose, and who, after a slow fever of three months continuance, was at length carried off by violent convulsions. Yet when I read this very case in the history of the Royal Academy of Sciences (*d*), and well weigh every word separately, he seems to me rather to have reported a thing which was related to him, than one which he had observ'd; and from hence arises even some suspicion, that the person who related it to him had not even himself seen it; but that having heard it from those who had seen the worm, he had probably transferr'd it, as frequently happens in similar cases, from sinus to sinus, that is, from the frontal (*e*) to the longitudinal sinus. For which reason, the question is not here, as you see, whether we shall believe Du

(*a*) Hist. Lat. Lumbr. c. 13. ubi de Ver.
mib. Cord.

(*b*) Act. N. C. Tom. 7. Obs. 14.

(*c*) Vid. apud Palsin. Anat. du corps hum.
P. 2. ch. 3.

(*d*) A. 1. 1700. Obs. Anat. 10.

(*e*) Vid. Epist. 1. n. 8, & 9.

Verney, or not; as it is not, in like manner, whether we shall believe Thomas Cornelius (*f*); since speaking of a girl in whom, after pains of the præcordia, which were very troublesome, and a frequent epilepsy, no other cause of death appear'd, except that "worms, like earth-worms, had eaten" away the vessels of the heart," he says, indeed, that he "had known" the girl; but does not say that he had seen the worms, although he at the same time expressly says, that he had seen the little worms in that starling in the glands which lie upon the œsophagus of a dog, and in other parts of other animals which he there mentions; and, in like manner, that he had seen worms "in the brain also, and in the heart, of various sizes and forms, and "sometimes not less surprising for their quantity than for their magnitude." Which words, however, seem to indicate, that these were rather polypous concretions in the shape of worms, as Vallisneri (*g*) conjectur'd that they were also in that girl fibres in the shape of worms, made up of a white and viscid matter, and adhering to the ulcers of the heart.

But though we should be unpardonable at this time to take things of that kind readily for worms, yet we must pardon both the man, and the times, in which the admonitions of Coiterus were not at all read, or at least so negligently, by most even of the learned physicians, that they number'd those very concretions, which he had said bore the similitude of worms, indeed, but were in fact made up of a pituita, as he call'd it, among the instances of true worms, which were found in the heart and in the brain. Probably you would not believe me, if I were not to produce the very words themselves which Cornelius has made use of in his enumeration of those worms that he look'd upon as perfectly real: they are as follows: "Volcherus Coiter also says, that worms of the same kind have, in like manner, been "sometimes observ'd by him; and not in the heart only, but even in the "brain, of those persons who have undergone the punishment of public "hanging." Nothing could have been more truly said, if Cornelius had judg'd, in the same manner, of some of his worms, as Volcherus did of his.

24. But now let us, at length, return from a prolix, but not perhaps in vain prolix, discourse upon false and true worms, to that by which I was led into it; I mean, to the history of polypous concretions that I had begun; which, lest it should be any longer suspected, that the polypus of the heart is a new disease, and to be accounted for, perhaps, from a new method of living in this our age, I have brought it down from the time of Helidæus, in which it was begun (*b*), to that of Coiterus. The observations of this anatomist were succeeded, in the following years, by the observations of those who saw polypi in the heart and vessels; as of Jo. Baptist Cananus, Gulielmus Ballonius, and Thomas Erastus. For the first, in the year 1574, found "a lump of fat, in the shape of a large tallow candle," in the left ventricle of the heart of Ostiario, the most serene duke of Ferrara, who died of a sudden death, as is related in the Sepulchretum Anatomicum (*i*), from Boschius the disciple of Cananus.

And if you compare this observation with that which immediately pre-

(*f*) Progyrn. 6. cit.

(*g*) Riisp. cit.

(*b*) N. 22.

(*i*) L. 2. S. 11. Obs. 5. § 5.

cedes (*k*), you will conjecture that both are the same, the word *Ostiariorum* only being through negligence omitted by those from whom it is copied; so that what was found in him may seem to have been found in the duke also. This you will better know by looking upon that fourth section of Boschius, which is pointed out, not page 438, for the whole does not exceed 76, but page 3⁴; nor will you wonder that, as often as ever he there names Cananus, and he often does name him, he adorns him with the title of “the very reverend.” For after the time that he was the physician of pope Julius the third, he seems still to have retain’d the habit of a priest; and perhaps more than the habit; since Fioravantio (*l*), when he wrote, which was in the fifteenth year after the death of this pope, and extoll’d this Canan, who was living even then, as more skilful than others in the anatomy of the eyes, spoke of him thus, *Il Rev. Monsignor Canan Ferrarese*; which is an address made use of to prelates and dignified clergymen only. And that he was the physician of pope Julius, I have been inform’d from a very learned and humane man, Thyrsio Pagliarini, the prebendary of Ferrara, who also gave me a very scarce work of the same Canan’s (*m*); as is confirm’d by Prosper Mandosius (*n*), who besides takes notice of the noble family of Cananus, and his *own brother* Julius, who was a cardinal of the holy Roman church. Which circumstances, and others that relate to the life of Cananus, and to his work, I shall, perhaps, have a more convenient occasion of enlarging upon. Let it at present suffice to have thus pointed out these things in a transitory manner, in order to give you to know, that what I could not find out in regard to this anatomist, for want of time and opportunity, when I added that postscript to the fifteenth anatomical epistle (*o*), I soon after met with in such a manner, that great weight was thereby added to the defence of him, which I at that time began; though I hope there will be no reason for prosecuting that defence hereafter.

But to go on to speak of the observations of polypi: Gulielmus Ballonius, in the autumnal epidemic constitution of the year 1575 (*p*), mentions a certain person in whom were found “caruncles, as it were, and those of an “oblong figure,” in the orifices of the vessels which go from the heart to the lungs.

Finally, Thomas Erasmus, as you have it in the *Sepulchretum* (*q*), in a book publish’d in the year 1580, describ’d a concretion “of a yellowish colour, like marrow, that has been boil’d, in the bones of oxen,” which was found in the hearts of two persons; one of whom, together with a fever and a pleurisy, had had a great irregularity of the pulse; and the other the same irregularity, but without a fever.

There is no occasion to mention every one, who having, after these, found such kind of concretions in the heart and vessels annex’d to it, compar’d them, at one time to marrow, at another time to fat, and sometimes even to flesh itself. For I have not so much as nam’d all that I had it in my power to name of the former authors; although Smetius (*r*), in the year

(*k*) Ibid. § 4. (*l*) Chirurgia, l. 2. c. 16.

(*m*) Muscul. hum. corp. pict. dissect.

(*n*) *Opuscul. Pontif. Archiatr.*

(*o*) N. 66.

(*p*) Epid. l. 2.

(*q*) Sect. hac 9. Obs. 3.

(*r*) Sepulchr. l. 3. S. 21. Obs. 3. § 24.

1576, in the body of a prince, whose pulse had been unequal, irregular, and intermittent, besides concretions in the ventricles of the heart, like those which Erasius has describ'd, has moreover remark'd, "that they were furnish'd with certain appendages:" which were certainly seen to have the greatest degree of length by Neretius (s), in a woman who had labour'd under a peripneumony, inasmuch as they went out from the right ventricle of the heart, fleshy, whitish, and flaccid, and entering into the vena cava, both where it ascends and descends, "were propagated quite to the head" and the os sacrum." And through another orifice of the same ventricle, Guarinoni (t) often saw a thick pituita, for so he call'd these concretions, extend themselves in such a manner into the pulmonary artery, that, by laying hold of the beginning of this pituita, he drew it out at once from all the branches of the artery, which was "so moulded by the vessels into their own form, that it seem'd to be a tree."

But the first of all who, as far as I can now remember, afterwards publish'd a delineation of that kind of tree, as it were, was Caspar Bauhin (u); and, at the same time, of a polypus both of the right and the left ventricle of the heart (x), together with polypous roots which had been inserted into the substance of both the ventricles, and a propagation of the left polypus into the great artery, the subclavians, the carotids, and the vertebals. And though he comprehended all these appearances under the general term of "adipose" matter, such as he had frequently observ'd in dropical and consumptive persons; yet in a certain girl (y) he has, besides a matter "like fat," in the right ventricle, taken notice, that a kind of a white, "membranous," thick, and oblong matter had been seen by him in the annex'd auricle, which was swell'd to a very great degree. Nor yet were others wanting, about those times, and afterwards, until Tulpus (z), in the year 1641, gave his figure and description of the polypus of the heart, who have mention'd, that the same things had been seen by them; out of whom it is sufficient to name one, whose books were in the hands of all, Riolanus. For he had publish'd the same things, which are extant in the Sepulchretum (a), of "pieces of flesh of the bigness of a fist, condens'd, and wrapp'd up in each other," being found by him "within the right ventricle, at the orifice of the vena cava, in some persons who had been suffocated by a sudden and unexpected death:" and particularly in the bishop of Malaga, at least, in the year 1626, in the chapter of his Anthropographia, there pointed out: to which he afterwards added others, as we read in the last edition of the same work, which belongs to the year 1649.

And indeed the very name of *polypus*, which all the physicians, who were present when the concretion was found by Tulpus, gave to it "with one consent," seems to be hinted at, as learned men have observ'd, in the books of Fabricius Bartoletus, publish'd in the year 1633, in which, when

(s) Apud Schenck. Obs. Med. l. 2. ubi de Cord. Excref.

(t) Sepulchr. l. 2. S. 1. Obs. 14. & l. 4. S. 1. Obs. 14.

(u) Tab. g. Fig. 2. in Append. ad Tab. Theatri Anat.

(x) Ibid. Fig. 1.

(y) Sepulchr. l. 2. S. 8. Obs. 14. § 2.

(z) Obs. Med. l. 1. c. 27.

(a) l. 2. S. 11. Obs. 5. § 2.

he spoke of concretions that had been seen by him, he us'd the word "polypodi."

25. But, although it had been seen by so many physicians and others, for it was not my intention to mention every one by name, but only by touching upon the heads, and the times, to digest into order most of the observations that are very well known, and so trace out to you a kind of history of the polypus; I say, although it had been seen by so great a number of physicians and others, and taken for the cause of the most violent disorders, and even of death itself; yet nobody publish'd a particular treatise upon it before the year 1654, in which Sebastian Pissini, a physician of Lucca, at length publish'd his epistle *de Polypo Cordis*; in which having confess'd, that the polypus was, indeed, "a new name," but "not a new appearance;" and having given, or referr'd to, some of his own observations, and some also both of the ancient and modern physicians; he endeavour'd to produce the signs of it, and to solve some theoretic and practical problems in regard thereto. He was about to be succeeded by Michael Kirstenius, the same whose observation and figures of the polypi of the heart were publish'd by Thomas Bartholin (*b*). For he intended, as Segerus (*c*) had written to Bartholin in the year 1657, "to draw up a dissertation on the disorders of the heart;" with which intention "he had made observations upon many polypi of the heart, and had shewn them delineated" to Segerus: "from which he suppos'd suffocative catarrhs principally to arise, for this reason, "because all those persons, in whom he had found these polypi, had been "carried off by this catarrh;" that is, by the circulation of the blood "being obstructed, and altogether stopp'd by concretions of that kind." Whether this dissertation ever came out, I do not know: at least I do not remember to have read that any one had seen it. In the mean while, Malpighi sent forth his dissertation, entitled, *De Polypo Cordis*, in the year 1666, having made an enquiry into the matter and structure of it. But as this dissertation, as well as most of the other principal things, which were publish'd since that, upon the polypi of the heart and vessels, by so many others, is very well known to you, and of course more than what I have mention'd before; I shall carry no farther these outlines of the history of the polypus, but shall immediately pass over to those things, for the sake of which I did not think it useless to premise the foregoing.

26. As to what relates, then, to the matter of the polypus, they who have compar'd it with fat, or flesh, or membrane, or pituita, are by no means to be argu'd against, as they have consider'd resemblance only; which, in the judgment of the eyes, is sometimes so great, that it seems as if no resemblance could be more perfect. And they who have imagin'd, not only that it was like these things, but was really one or other of them, were satisfied with a slight examination, or no examination at all, and consequently deceiv'd by the appearance of the thing. Thus they, who so far were convinc'd of its being of the adipose kind (*d*), as to wonder how it could con-

(*b*) Cent. 3. Hist. Anat. 17.

(*d*) Vid. Boschii Lect. 4. & Barthol. Cent.

(*c*) Tho. Bartholin. Cent. 2. Epist. Medic. 1. Epist. Med. 2.

crete in such a manner, even in that place, the heat of which, according to Galen, "could scarcely be borne by the finger of a living person," seem, beyond a doubt, to have neglected the experiment of the fire. And it is very surprising, as they believ'd it to be fat, that they did not either doubt upon that doctrine of Galen, or in regard to the concretion, whether it had happen'd while the man was living, or rather after the body was already grown cold: although it is more to be wonder'd at, that in a much more modern time there were not wanting some who deriv'd the matter of the polypus from the fat of the heart itself, by carrying it through, I know not how, from the external to the internal parts.

But they who have judg'd polypi to be flesh or membrane, if they really have not always been deceiv'd, but have seen their fibres to be, sometimes, continu'd with the fibres of the heart, and that true blood-vessels were produc'd through them, neither of which it has yet happen'd to me to see amongst the almost innumerable polypi that have occur'd to me; they then did not meet with those polypi of which we treat at present, but excrescences of the heart. But it is one thing, that the small roots or fibres of the polypi should be ingrafted, as it were, into the very small foveolæ, or cavities, and little foramina, of the heart, and at the same time show a kind of similitude of vessels creeping through them, or within them; and another thing, that the fibres themselves should be continu'd, and that vessels furnish'd with certain and peculiar coats should fall under the eyes, and knife, of the persons who cut into these polypi.

Valsalva was formerly inclin'd to this opinion, and imagin'd that he had seen a great number of small vessels in a certain polypus, which he had also accurately delineated; but from the examination of similar polypi, he perceiv'd the fallacy, and what he had before delineated afterwards blotted out.

At length, they who have said that the polypi were made up of a pituita, if by that they meant any thing else than the matter, of which the crust that lies upon the top of coagulated blood is compos'd, are certainly not so much to be approv'd of, as they who have understood that very matter itself. For what else do we suppose, at present, but that this matter is the principal and peculiar matter of the polypus? or what difference would the celebrated man Andreas Pasta(e) find to have been observ'd between that crust and the polypous concretion, by Malpighi and Willis? or what difference could he find, in fact, not only by reading these authors, but by comparing these matters together accurately, and examining into their structure?

But that this matter was really the pituita of the ancients, that excellent physician Salius, who was extremely well skill'd in their doctrine, has, among others, clearly shewn(f). His words are, "We see that not only both the
" species of bile, when thrown out with the blood from the vein, coagu-
" late, but even the pituita itself, which is sometimes concreted on the sur-
" face of the blood, to such a degree, that it can scarcely be cut through
" with a knife; and that unless this, and the slimy part of the blood, be
" mix'd with it, tho' the blood may indeed coagulate, however it is thrown
" out from the vein, yet it does not coagulate so soon, nor make so firm a

(e) *Epist. de Cord. Polypo*, n. 17. & seqq.

(f) *De Affect. Partic. c. 4.*

"coalition,

"coalition, as generally happens to it, when the melancholic and pituitous humours are copiously mix'd with it." And these words I was willing to copy over perfectly, that you might compare them with those which that very experienc'd man Louis Petit has written in a memoir (g) upon the method of stopping hæmorrhages, where he has observ'd, that the red part of the blood coagulates so much the more loosely, as it has the less of the white part mix'd with it, and *vice versa*; so that the crust is, for this reason, most hard, because it is made up of the white part of the blood alone. But you will see that this remark was likewise made even on dead bodies, by the same gentleman; I mean, that in the blood, which has so coagulated in the heart, and in all the vessels, whether venous or arterial, the white part is distinct from the red; the red occupying the inferior place, and the white the superior; "provided the body has grown cold in an horizontal situation, "as generally happens."

27. But although these things, in regard to the matter of polypi, and their structure, so much like that which is observ'd to take place in the crust of blood, and in regard to the formation of the crust, on the upper part of blood which has been suffer'd to cool quietly, as is almost every day seen; although these things, I say, as they were very well known, ought to have created a doubt in the minds of physicians, whether polypi were form'd long before death, or rather, whether they were not form'd after death, especially from the time that they had read the observation which I just now mention'd, made by Petit on dead bodies; yet so much did that too-prevailing persuasion of the pre-existent polypus encrease every day, that unless the very celebrated man Andreas Pafsa, whom I just now spoke of, had risen up, *qui*

Tollere contra

Est oculos ausus, primusque obistere contra (h);

"Who first the rage of error dar'd restrain,

"And shew to ruling pride the madness of its reign;"

what end this doctrine would have had amongst most persons, or when it would have had an end, I do not very well know. And I said "first," because Kerckringius (i) attack'd the concretion of all the parts of the blood, rather than the concretion of the white parts in particular, that is the polypus; or if he did attack this, it was with so feeble an arm, that, as the defence of Malpighi (*) seem'd to be much more firm, and was really so, if you attended only to Kerckringius, after the time in which both of these pieces came out, most persons still went on more and more to produce observations of polypi, from whence both the preceding disorders, and death, were accounted for, and explain'd. Suppose any person had been of a weak and tender constitution, and often indispos'd in his health, for fifteen, or even for twenty years together. If in the heart of this body, after death, should have been found a polypus, this was immediately said to have existed from the

(g) Mem. de l'Acad. R. des Sc. A. 1732.

(i) Spicileg. Anat. Obs. 73.

(h) Lucret. de rer. nat. l. 1. v. 67.

(*) Op. Poiss.

very beginning of his disorder, and to have been the perpetual author of all his evils. And the same was equally accus'd, when found after a disorder that had suddenly carried off the person. But perhaps the heart was found, at the same time, to be bigger than was natural; or its auricles were found to be of an amazing magnitude; or the lungs were, at the same time, much diseas'd, and the *aspera arteria* compress'd. Yet still the polypi were blam'd. There is no necessity for me to mention any one in particular, since there have long been, in the hands of every one, writings which testify this. However, they can do less harm when they, at the same time, produce to us such causes as we may with more justice accuse. But those which do not produce them, do not only produce very considerable arguments that frequently they were not sought after, but also show, pretty clearly, how much disadvantage medical science has receiv'd from polypi; since after a polypus being found in the dissection of a body, it was immediately pronounc'd, that sufficient enquiry had been made; so that what diseas'd appearances, besides these, might lie hid in the thorax, in the belly, or in the head, from whence the more real causes of disease and death might be learn'd, were, by this means, neglected to be enquir'd into.

And you will suppose, that the administration of justice has receiv'd no less inconvenience from thence; for you will read that the polypus has, by the physicians, been brought in guilty, before the judges, of the crime of the person who was really guilty; I mean, of those who had kill'd men, that were strong, and in good health, either by the sword, by clubs, or by poison, whether there appear'd any marks, internally, of the injury which these things had brought on, or whether such injury was not very nicely enquir'd into, after the polypus had been found. Without doubt physicians suffer'd themselves to be carried away by this method of reasoning, that a polypus could not be so speedily form'd after death: and did not attend to these two other arguments, that the crust was no less speedily form'd on the top of the blood, when taken from a vein; and that if the polypus had occupied the heart long before death, the man could not possibly have been thus strong, and perfectly in good health, as they confess'd he had been. And even from this very circumstance, by which they ought to have been admonish'd that these polypi were not diseases, I mean, the frequency of them; (for who was there then that had not labour'd under this disorder?) by this very circumstance, I say, they suffer'd themselves to be persuaded to assert, that the polypus was a much more frequent disease than was in general imagin'd; whereas Guarinoni (*k*), even formerly in regard to the polypus, which, as I have shown above (*l*), he us'd to mark out by the name of *pituita*, has written the following words, in a certain observation, from which the true state of the case might have been learn'd: "The heart was without that *pituita* which it commonly has in dead bodies." Nor are those words of Celsus (*m*) more true, perhaps, of any other thing in dead bodies, than of the blood: *Tale esse quale mortui sit, non quale vivi fuit*. "That it is of such a kind as is natural to a dead body, and not what it was in the liv-

(k) Sepulchr. l. 4. S. 1. Obf. 13. in Addit.

(l) n. 24.

(m) De Medic. in Præl.

ing." How little effect then the confutation of polypi, undertaken by Kerckringius, in a part of his work, had had upon the minds of the greater part of physicians, you want no farther information.

But Pasta having purposely attack'd these polypi, in quite another manner, and by a different method of reasoning, so far call'd them into question, both in his letter publish'd for that purpose, and in another shorter epistle, which was publish'd by that celebrated man count Francesco Roncallo Parolini (*n*), as to make appear to me, that very few polypi can now be produc'd, of which we may not doubt whether they were form'd long before death. And it is long since, indeed, that I began myself to doubt sometimes, not only of those slighter concretions, which, as I met with them in most bodies, I often was displeas'd with, or sometimes smil'd at, if I happen'd to hear any one of the persons who was present accounting for the disorder from thence, as from its cause, which, at the same time, was sufficiently apparent and obvious in another place; but of those larger and harder concretions, such as, in the year 1703, I found occupying both the ventricles of the heart, and all the large vessels adjoining thereto, in the body of a young man who had been taken off within three days by the most acute disease, though of what kind the disease was I have not made any remark; but I have noted down this suspicion of mine; that is to say, as there were, together with these concretions, only a very few, small, and, at the same time, soft coagula of black blood, by which it seem'd, that life could not have been preserv'd, even for a few moments of time, that after death, finally, the greatest part of the blood had been form'd into these concretions.

And I suspected the same thing to have happen'd in those whom Lower (*o*) has said to have been dissected by him, and in whom the heart and the vessels were so stuff'd up, as to make him "wonder, that the heart was, by "any means, constring'd; or that the remaining part of the blood, which "was still fluid, had any room to circulate in those vessels, in order to pre- "serve the life and heat in those parts;" to say nothing of that body in which the orifice of one of the ventricles of the heart was so far stopp'd up by these concretions, that "there scarcely remain'd a passage into the ven- "tricle, sufficient to admit a goose-quill, whereby the blood could flow in," and the orifice of the other "could not be open'd by the fingers without "difficulty." These suspicions were help'd forwards, not only by similar histories, but also by other circumstances, part of which I have hinted at just now, and shall partly take notice of below, as well as by those things that I read in some authors; as, for instance, Coiterus and Riverius. The former of whom having found polypi, which had the shape of worms, as is related above (*p*), just in the same manner in those who died by hanging, as in a woman who had died of a phrenitis, and there appearing to him no reason why they should be suppos'd to have been form'd before death, in the hang'd criminals, it seem'd to him, that they might also have been form'd after death in the phrenetic woman.

(*n*) in Epistolis post Historias Morbor.

(*o*) Traët. de Corde, c. 2.

(*p*) n. 23.

And Riverius, as you will read in the Sepulchretum (*q*), has given us an observation of caruncles, of which “the larger, being almost as big as a “filbert, and shutting up the orifice of the aorta,” in a man who had first labour’d under an inequality of the pulse, and at length had died of an asphuxia, was suppos’d by Riverius to have been the cause of these disorders; notwithstanding other causes were not wanting to which they might have been more justly attributed: nor does it seem possible, that a caruncle of this size only should stop up that large orifice in a man; especially as, in the scholium, “a similar caruncle” is spoken of by the same author, “but of a much “larger size,” which was found in the heart of a soldier who had been slain, and who, “nevertheless, had previously enjoy’d good health.” There is no doubt but you see what is the consequence of this observation; although Riverius did not omit endeavouring to obviate the objection, by producing that distinction, which I see many others also have made use of after him, of the caruncle in the soldier being in part connected to the parietes of the ventricle; whereas in the other it was quite loose and free; so that in the latter it might be driven into the mouths of the vessels, and in the former could not.

However, I suppress’d all my suspicions in silence, till the matter might become more clear to me; and, to confess the truth, should certainly have still suppress’d them, being detain’d in a state of hesitation by the arguments which were generally advanc’d in favour of polypi, if I had not, at length, seen that they were nearly overthrown by the industry and ingenuity of *Pasta*.

28. And in the first place, the signs of a polypus, which I suppos’d to have been collected by the most learned men, not without an accurate and cautious examination into most of the observations which were extant of this disorder, seem’d to forbid my disbelief. And although I was not ignorant, that any one pathognomonic sign could rarely be had in diseases, and wonder’d that there was not wanting in my memory a person who taught; that a very vehement pulsation of the carotid and subclavian arteries was the symptom of that kind in the case of a polypus, as I knew that this had been often observ’d where there was no polypus, which is confirm’d even by some observations that I have written to you (*r*); yet I scarcely read any author of all those by whom the signs of polypi are taken notice of, who did not place an intermitting, or, at least, an unequal pulse among them; which you may have observ’d to be often related even in the short history of the polypus that I have trac’d out (*s*); and you know it is pointed out by some one as the pathognomonic sign of a polypus. And I did not wonder that this man was refuted even by the senior doctors of his own sect, when I call’d to mind those observations in which I had found polypi without this symptom, or had not found them where it was: of which kind those are, in regard to the first species, that you have in the seventh letter, number eleven and thirteen, and in this very twenty-fourth letter, number six; and in regard to the second, those which you will have in other letters: to which you will

(*q*) L. 2. S. 8. Obs. 14.

(*r*) Epist. 17. n. 23. & Epist. 23. n. 6.

(*s*) N. 22. & 24.

then add those in the twenty-first letter, number thirty-four, and in the twenty-third, number six.

And when, in reading over again the ninth letter, you light on that history (t), by which it appears that an inequality of the pulse had been remov'd by the sparing, but continu'd, use of opium, you will not suppose, if I am sufficiently acquainted with you, that this arose from a polypus.

Yet, notwithstanding these things were at that time, in part, clear and obvious to me, I nevertheless still thought that these were a few exceptions, such as are often met with in medicine, not of sufficient importance to be oppos'd to the diagnosis that had been determin'd upon by the most experienc'd men; especially as it did not escape me, that the force of signs was not to be weigh'd by considering one or two separately, but by considering many in conjunction. But about this time came out the letter of the most learned Faſta, in which (u) so many observations of polypi are collected, and of those even that were remarkable for their number or for their bulk, which had been found by the most famous authors when no signs of polypi had preceded, that the diagnosis thereof which has been given may seem to be frequently useless; or, if it has been made under the guidance of reason, must lay us under a necessity of doubting, whether those polypi, of which not the least sign had existed in the living body, had existed previous to death. And while I read over again these observations, I find two, the one of Winclerus, the other of Borrichius, which I shall object to that distinction of Riverius (x) taken from the caruncle being loose or connected. For there were polypi in both of these observations, "which had grown to no part, "were no-where connected, but free" and loose; yet not the least remark was made of any intermission or inequality of the pulse. I will also add here what was observ'd by the celebrated Joerdensius (y), who having ingeniously confess'd, "that all those signs which have been brought by authors "to distinguish a polypus that is already form'd, even when collectively "taken, did not satisfy him so far as to suffer him to determine any thing "for a certainty in regard to the presence of it;" presently testifies, when, in the examination of each separate sign, he comes to the intermitting pulse, that he had "never" observ'd this in persons who had polypi, "except in "those that were dying:" and yet in the great number whose disorders and dissection he either particularly describes, or briefly refers to, it happen'd to him, that "he found all the polypi, except one, which was the largest of "all, not connected to the sides or columnæ of the ventricles of the heart, "but quite free and loose."

Now then, as that first position, I mean, that a polypus has often been found without an intermission, or any inequality of the pulse, is sufficiently demonstrat'd; to omit other observations which were at hand, and particularly those of the celebrated Trew (z); we may confirm the other equally; to wit, that intermission of the pulse, and even other inequalities, amazingly various, had been observ'd where no polypus was found, not by one only,

(t) N. 7.

(u) N. 4.

(x) Vid. supra, n. 27. circa fin.

6

(y) Aët. N. C. Tom. 4. Append. n. 5.

§ 5, & 6.

(z) Eorund. Aët. Tom. 2. Obs. 53.

but by many observations of the most eminent men, as indeed it ought to be confirm'd, and yet not by all which it is in our power to produce. First, then, let it suffice to have pointed out seven only from the great number in the Sepulchretum; as of Gregorius Horstius (*a*), Nicolaus Tulpus (*b*), Lazarus Riverius, (*c*), Lælius a Fonte (*d*), Joannes Prævotius (*e*), each one single observation, and of Hieronymus Cardanus (*f*) two. For if you read these observations, you will find that the pulse had been "intermitting," also "unequally intermitting;" that it had been "unequal," even "surprisingly unequal, exceedingly unequal; disturb'd by every kind of inequality, and very much varying in each different state, without the least regularity or order." But although you will find in every one of these seven patients, that disorders either of the heart or pericardium, which in some of them were very considerable, or of the lungs, as in the greater part of them, or of other parts, are describ'd; yet in none of them will you see, that a polypus, or polypous concretion, has been taken notice of. Nor will you see this in other histories that may be added to these, as of Brunnerus (*g*), Gullmann (*h*), and Lancisi (*i*), in which the pulse is said to have been "unequally intermitting, unequally unequal, irregular and unequal, unequal and intermittent; although whatever of morbid appearances was found after these pulses, particularly in the heart, the great artery, and the vena cava, were by no means pass'd over in silence. And what will you say to this, that in a girl of four or five years of age, whose disease and dissection that very eminent man Du Verney the younger (*k*) has written, although her pulse, being at one time quick, at another time slow, and intermitting besides, and even at intervals for a time suspended, made them afraid of a polypus of the heart; nothing was found worthy of observation in the heart, but a scirrhus tumour at the basis of it, of the bigness of a nut, which lay upon the pulmonary artery, and was connected by a kind of roots with the spine. And the most celebrated man John Targioni (*l*), when he describ'd the disorders of the great vessels of the heart, and the neighbouring parts, in a nobleman of Florence; left any, by reason of the pulse, which had constantly been, for a long time, "irregularly irregular, and intermittent," should suspect that a polypus had been omitted by him; expressly added, "that not the least polypous concretion had been found." And that you may not suspect this of others, which I spoke of just now; call to mind, not only the accuracy of most of them, but the common custom of all, by which, as physicians did not yet make use of the word polypus to signify the appearance we are speaking of, they, nevertheless, did not omit to take notice of it under other names which are mention'd above (*m*); and also how much effect some certain disorders of the lungs, or of the heart, or of the vessels annex'd to it, may have in perverting the pulse; and, finally, that from these

(*a*) L. 2. S. 8. Obs. 35. § 1.

(*b*) Ibid. Obs. 23. § 1.

(*c*) Sect. 5. Obs. 21.

(*d*) L. 4. S. 1. Obs. 45. § 6.

(*e*) Ibid. Obs. 3. § 10.

(*f*) L. 2. S. 9. Obs. 33, & 22.

(*g*) Eph. N. C. Cent. 6. Obs. 1.

(*h*) Forund. A&T. Tom. 1. Obs. 4.

(*i*) De Aneur. Propos. 53.

(*k*) Mem. de l'Acad. R. des Sc. A. 1704.

(*l*) Prima Raccolta d'Osserv. Med. pag. 116.

& 119.

(*m*) N. 22. & seqq.

disorders of the lungs and the heart only (for there was no-where “any polypous appearance”) Paſta (*n*) had alſo found, in two men, whoſe bodies he examin’d for that reaſon, beſides other ſigns of a polypus, that “an unequal and continually intermitting pulſe” had come on even ſome months before their death.

29. And as, in order to confirm that polypi had exiſted long before death, the dilatations of the cavities in which they are found are wont to be produc’d, as if they had ſucceeded to the polypus, as effects to their cauſe, Paſta does not do what I have done in the ſecond *Adverſaria* (*o*), where I ſhew’d, that the circumſtances might be conſider’d in quite an inverted ratio; but even by thoſe very hiſtories from which ſome believe it to be clear, that dilatations had been the conſequence of polypi, he plainly ſhews (*p*), that polypi in living bodies are not ſufficiently prov’d; becauſe it not only does not neceſſarily follow that theſe polypi had exiſted previously to the dilatations, but not even that they had exiſted afterwards in thoſe bodies when living, as they might finally have been generated after death: for he makes it appear, that dilatations are frequently found without polypi, and that the ſigns of polypi, which had exiſted in thoſe in whom dilatations are found, might have been the ſigns of theſe dilatations only. From which ſingle circumſtance many things ſeem to me to follow, but two in particular. And firſt, that they who have deliver’d down to us the diagnoſis of a polypus from thoſe things that they had obſerv’d in patients in whom dilatations and polypi were found at the ſame time, did not act with ſufficient caution. Thus, not to depart from the ninth ſection of the *Sepulchretum*, if any one, for example’s ſake, turn to the titles that are prefix’d to the ſecond and tenth obſervations, he will, doubtleſs, ſuppoſe that “the inequality of the pulſe,” in the firſt, had ariſen “from the left ventricle of the heart being ſtuff’d up with blackiſh fleſh;” whereas ſome regard is to be had to the heart itſelf, which was “extended, like the uterus, to the bulk of that fleſh,” the weight whereof was equal to that of “two pounds:” and in the tenth obſervation, “the interception of the pulſe” will ſeem to any one to be owing to “two polypi in the heart;” particularly as that obſervation, which is produc’d there only in part, relates nothing beſides theſe that was preternatural. But a great danger of erring is thrown in the way of curſory readers by this cuſtom of producing mutilated hiſtories. For who would ſuppoſe, that where the queſtion was of the pulſe, a great diſorder of the heart itſelf ſhould be paſſ’d over in ſilence? And yet if the ſame obſervation be look’d into, where it is given in another place (*q*), in its entire ſtate, we find that, together with thoſe polypi, there was “a heart bigger than that of an ox, filling “the whole capacity of the thorax.”

The ſecond conſequence, which I hinted at juſt now, ſtill more weakens the diagnoſis of the polypus. For they who have propos’d it, as they plainly foreſaw that the ſigns which they brought might be common to other diſorders, have added this, that thoſe ſigns would be uſeful “when other ſymptoms, by which ſimilar diſorders are wont to be diſtinguiſh’d, are

(*n*) *Epist. de Cord. Polyp.* n. 9.

(*o*) *Animad.* 40, & 41.

(*p*) *N.* 5. 7. & ſeq. & 13.

(*q*) *L.* 3. *S.* 7. *Obſ.* 45.

“wanting.”

"wanting." Thus said Pissinius (*r*). And before him Riolanus (*s*), where he happen'd to mention polypi, had subjoin'd the following words: "Those who are oppress'd with a difficulty of breathing, with an interception of the pulse, without a cough, without any suspicion of a dropy of the lungs, or a vomica, ought to be suspicious of a sudden suffocation of the heart," that is, from a polypus. And, in short, others added exceptions of the same kind in a different manner. But how the symptoms of similar disorders will be wanting, if those which are suppos'd to be the signs of a polypus agree also with dilatations of the heart, "and aneurisms either of the trunk of the aorta, or of the left ventricle of the heart," as is confirm'd by the celebrated Pafsa (*t*), "deceive us, more than other disorders, with the appearance of polypi," I am not able to conceive.

But you will say, when a polypus shall be found without any aneurism, without any other injury of the heart or vessels to which you can attribute the preceding disorders of the patient; then these, at least, will be signs of the polypus, and consequently the polypus must have existed before death. But Pafsa does not allow that these things follow, even then, for a certainty (*u*); as he had sometimes observ'd all the symptoms of a polypus in those persons also, in whom there was neither any of these injuries, nor a polypus: for which reasons, as those symptoms must then of course have proceeded from some other cause, which even escapes the notice of the senses; as, for instance, from the disorder of the cardiac nerves, which he hints at in another place (*x*); so nothing forbids us to suppose that they may proceed from the same cause in those also, in whom polypi are found, particularly as the whole letter sufficiently shews how much more probable it is that the polypi are not form'd 'till after death.

When I revis'd this letter of mine to you, I took into my hand that excellent treatise upon the heart by the illustrious Senac; and reading over that chapter (*y*) which is entitl'd, "Of the polypi of the heart," I rejoic'd that his judgment, also, disapprov'd of those persons (*z*) who chose rather to ascribe the signs of the polypus, and amongst others the inequality of the pulse, to the polypus, than to the disorders which are found together with the polypus, and, amongst these, that of the dilated auricle of the heart. Were not, says he, all these symptoms, and even the polypus itself, to be attributed to this dilatation? And he has not only a great many other things worthy of singular praise, but this in particular, that there is a great difficulty in knowing and distinguishing true polypi. For he says, that in so great a number, those which he acknowledges to be true are "rare (*a*):" and as he affirms, that the effects of these are the same with those of so many other obstructions, which oppose themselves to the circulation of the blood through the heart, he at length scarcely attributes thus much to the inequality of the pulse alone, and that varying, not what others had already done, that we may take the diagnosis of polypi from thence, but only that we may suspect "them:" I say, suspect them; for it could not have escap'd him, that there were other even

(*r*) Epist. de Polypo Cord.

(*s*) Anthropol. ut. edit. l. 3. c. 12.

(*t*) N. 27.

(*u*) N. 6.

(*y*) L. 4. ch. 10.

(*z*) N. 10.

(*x*) N. 11.

(*a*) N. 9.

inconstant obstructions besides a polypus, suppose from the various irritation of the nerves, which, if it fall on the nerves of the lungs, for instance, will lay various difficulties in the way of the blood that is about to go out from the heart into the lungs, or return from the lungs into the heart: and this example I make use of, because the very same is, in some measure, hinted at a little afterwards (*b*); for other examples may be collected also from the following chapter (*c*); and even without these, the opinion which he has laid down in another place (*d*) will be sufficient; I mean, that an inequality of the pulse is owing to a disturb'd action of the heart and nerves.

And how long this disturbance may last, and at the same time how various it may be, perhaps nothing will better shew you, than what I lately read in the third volume of the Commentaries of the Institution of Sciences at Bologna (*e*). For that celebrated man Molinetti, having tied up one of the nerves of the par vagum, in the neck of four dogs, nor having immediately untied them, as Vallalva us'd to do, presently observ'd in all of them, that the motion of the heart "was in no respect equal, was irregular, and intermitting, without "any order;" and in one of them, besides, in whom he had even cut the same nerve, he observ'd that motion to be "immoderately confus'd," and that it had not return'd to its usual regularity, in those dogs, before the seventeenth, the twenty-ninth, the twenty-third, and the twenty-seventh day. Therefore, if any considerable injury happen to this nerve, or any other which belongs to the heart, you perceive what may be the consequence of it; and how judiciously that archiater whom I just now commended, has determin'd, that the diagnosis of a polypus could not be taken from a pulse of that kind, but only the suspicion of one. But, perhaps, you will say here, What if an unequal inequality of the pulse be produc'd beyond the twenty-ninth day, as I have known it happen in many, and persevere very long? Pasta even obviates this objection (*f*); and I wish that those injuries of the brain, or of the nerves, did not often happen, which can neither be cur'd, nor be chang'd, and, for that reason, last a great number of years, and even to death itself. But as injuries of that kind, for the most part, escape the senses, it is not to be wonder'd at, if in the bodies of those who had been troubl'd with a variously unequal pulse, either with or without disorders of the heart, nothing at all be found to which you could attribute this symptom. For although those disorders of the heart are of such a kind, that they cannot now appear in one shape, and presently in another; yet the injury of the nerves might be added to them, from whence that variety might arise, which may even arise from thence without those disorders, as is hinted at by Pasta by no improbable doubt.

30. It is not my intention to run through all the heads of his epistle, which you yourself may read, and perhaps have already read. It is sufficient, if I say, that scarcely any of those things is omitted, which, on one hand, ought to incline us to doubt whether there are any polypi in living bodies; and, on the other, ought to make us less confide in those reasons which are generally produc'd in order to demonstrate that they do exist in living bodies.

(*b*) N. 11. (*c*) Ch. 11. n. 9. (*d*) L. 3. ch. 7. n. 9. (*e*) In Opuſc. (*f*) N. 11.

What then, you will say, are we to do in the mean time? We must wait till another experienc'd and learned man shall answer that epistle, in such a manner as to remove all these doubts by a clear and strenuous way of reasoning; which to me, as I have formerly said (g), does not seem very easy to do. And unless this be done, I will certainly continue to speak very cautiously of polypi; nor will I suffer myself to lay down those things as certain, which are doubtful with me. Nor are we any longer at liberty to use that excuse which we were formerly at liberty to use. Zollicofferus had written, for instance, in his dissertation *De Polypo Cordis* (b), in the year 1685, "In the same manner in which the blood of pleuritic, cachectic, or other diseas'd persons, taken away by opening a vein, while it by degrees loses the motion which had before mix'd all its parts together, and involv'd them one with another, thrusts out upon the surface a white, viscid, and dense substance, entirely similar to our polypus; there is nothing which hinders me from believing, that such a concretion may be form'd in the heart, and the vessels of subjects of that kind after death, as well as in the blood that has been taken from a vein; especially as in these subjects some portions of coagulated blood are found subsiding from that polypous concretion, which are very much like the black and thick blood of pleuritic patients." But if you should then have enquir'd of him, why, after saying these things, he immediately went so far on the other side of the question, as not only to profess that he, however, "could by no means grant, that every polypus was at length form'd after death," but even asserted almost the same things of polypi that others had done; he would, without doubt, have produc'd those arguments for the fact which he has subjoin'd (i); and these arguments were a sufficient excuse for him, as they had never been call'd into question by any body.

But what pardon could be granted to us, if we us'd the same arguments? after these very arguments have been so overturn'd by Pasta, as I have shewn above (k). And if we would depend upon other arguments, as, for instance, those which you will read in some authors, to except, at least, those polypi that adhere to the parietes of the ventricles, and are entangl'd with the tendinous fibrillæ either of the valvulæ mitrales or tricuspidæ, or those which are of such a hardness and firmness that they cannot be dissolv'd by the fingers, and for that reason shew that they are not the work of a very short time; Pasta has also taken up and consider'd these exceptions (l). For as to the hardness and firmness of these concretions, he takes notice how great these properties sometimes are in the crust of blood that has been taken from a vein, and in how short a time this may be generated. And as to the adhesion to the parietes of the ventricles, he affirms that blood, if it be receiv'd in the ventricles of an ox's heart, instead of a glass vessel, provided the matter of which the crust is made up equally abounds, adheres to the parietes of these cavities just as polypi are wont to do: which I suppose he might also have said of their being entangl'd with the fibrillæ of the valves; since I observe that he has produc'd an example, from Moinicenius, of polypi

(g) Epist. 18. n. 9.

(b) § 13.

(i) § 14.

(k) N. 29.

(l) N. 20.

that (*m*) “were entangl’d with the tendons of the valvulæ mitrales,” among those observations, which, as there had been no symptom of a polypus in the living body, relate to those polypi that are produc’d after death.

But shall we believe that those polypi, at least, had not been compacted together, but in a long course of time, and on various occasions, which are fibrous; which, in some measure, emulate the nature of a membrane, a tendon, or a nerve, whether you look upon them, or draw them backwards and forwards with your hands; which show strata or layers, roll’d one over another; or, finally, those which are hollow like tubes? We should, perhaps, have believ’d it, if *Pasta* (*n*) had not produc’d observations, from which it appears plainly, that all these things may be evidently seen also in the crust of blood that has been taken from a vein: and in respect to the hollow polypi, he had observ’d some things (*o*), from which it is easy to form a conjecture, that a crust may have been form’d out of the blood which was still fluid, and in a state of rest, round about a coagulum, which was already form’d within some vessel; I say round about; which you will more readily understand, if you suppose with me, that the body has been, when it was not yet internally destitute of its warmth, turn’d upon its face or side for the sake of washing it, or for any other reason; and that after this, at the time of dissection, or taking out the viscera, the coagulated blood may have fallen out from the surrounding crust, and left it in the shape of an empty tube.

But you will say, perhaps, there are some disorders so join’d with a polypus, that they seem entirely to have proceeded from this. For in the first place, *Schulzius* (*p*) produces examples of two œdematous tumours; the one in the feet and the nates of a young man, and the other in the right foot of a woman. The young man had a thick polypus in the vena cava, at the conflux of the iliacs; and the woman had one in the right iliac. It therefore seems, that the polypus must have existed in both of them, when living; which opposing itself to the quick return of the blood, was the cause of the œdematous tumour. And this I perhaps might have assented to, if there had not been other polypi in the young man, and those of a “stumpous” magnitude indeed, not only in the heart, but also in the vessels which communicate with it, and not the least effects of them were shown elsewhere; and if the disease, of which the woman had died, and the external causes which probably had preceded the œdematous tumour of the foot, and whether there were any other polypi likewise in the distant vessels, were not pass’d over in silence.

You would then, perhaps, produce some dilatations of the heart, or the auricles, which, as there may have occur’d to you no other cause of them, you would possibly contend were brought on by the polypus that you had seen contain’d within them. But I would not advise you to be too sanguine in your contention, for there are so many causes of dilatation, even among the antecedent causes, and some of them are of so hidden a nature, or of so long a standing, that they are frequently not even known to the physicians of the patient himself, or to the attendants of whom you may enquire; as,

(*m*) n. 4.
(*o*) n. 24.

(*n*) n. 20.

(*p*) *Ag. N. C. Tom. 1. Obs. 220. & Com. Litter. A. 1731. Specim. 10.*

for example, vehement, but conceal'd, passions of the mind; foregoing violent inflammations of the lungs, which the patient had labour'd under, at a different age, or in different countries; and other things besides of the like kind, which may be read in the treatise of the most illustrious Senac (*g*). For these causes, particularly if they have happen'd to those whose heart was already dispos'd to dilatation, have frequently dilated it, sooner or later, in proportion as that disposition to dilatation was greater or less; so that, for this reason, the patients have not been always able to observe, from what cause, and at what time, the beginning of this dilatation was made.

But finally, you might take an argument to appearance much more strong, from the observation of the illustrious Haller (*r*), which tells us, that in the vena cava of a woman, betwixt the renal veins and the iliacs, "nothing remain'd in the place of the cavity but a kind of fibrous, polypous, and, " as it were, hard flist." For as the right spermatic vein, in order to carry back the blood that was brought in by the inferior aorta, and to discharge it into the ureteric vein, which belongs to the iliac of the same side, was made "enormously wide," and was even "an inch in its diameter," and the ureteric vein also was "equally dilated;" it seems that this polypous concretion, which prevented the ascent of the blood, must have been form'd there, long before the death of the woman.

But as, nevertheless, Haller writes, that the vena cava had been "concreted" in that place, and points out an example of the concretion thereof, from the *Mantissa Anatomica* (*s*) of Rhodius, who says, that the cava "had been very closely consolidated, so as not even to admit a probe, without doubt from ulceration;" and as even the very ingenious Haller confesses, "that he does not understand the reason of the vena cava being grown together in its sides," in the woman he speaks of, "as in the body no cause which could be suppos'd capable of compressing so large a vein," was found; and Winklerus (*t*), the celebrated professor in the Anatomical Theatre at Gottingen, speaking, as it seems, of that same woman (notwithstanding neither the age, nor the year of making the observation, which is pointed out, greatly agrees therewith) in whom the spermatic vein equall'd the vena cava in magnitude, says, that he saw it to be totally obstructed "from coalition;" it is easy to conjecture, that this coalition, which was certainly like what I shall describe to you, as it was seen by me in another letter (*u*), had been previous to death indeed; but that the polypous concretion, which was form'd under the very place of coalition, within the vein, had been produc'd, as so many others have been, in the latter moments of life.

And this being the state of the question, and as I do not see that any thing has been produc'd, by which what you argue for is put beyond the reach of very just doubts and hesitations; I should believe, that but very few concretions could be excepted out of so great a number, of which we may not deny, that some were begun, and that others were completed, in the living body. For they may possibly have been begun in dying persons, or in those who

(*g*) Traité du Cœur, l. 4. ch. 8. n. 3. & 4.

(*r*) Opusc. Pathol. Obs. 20.

(*t*) Obs. 21.

(*s*) Differt. de Vaso. Lithiasi, S. 1. §. 6. Adnot. 2.

(*u*) 56. n. 10.

have been so oppress'd by a very long syncope, and which, by reason of the blood being already almost cold, is incurable, that they seem just like dead persons, rather than living, if the blood be of such a kind as that generally is, which is most apt to generate a crust. And they are perfected in those aneurisms, in particular, which resemble the shape of an appending sac. For there I have seen them myself, not "under the appearance of that hollow flesh" which the polypi sometimes have in the ventricles or the auricles of the heart; and still less so that they could, by any means, be look'd upon "as excrescences of the coats of the aneurisms;" but of such a kind, as I have describ'd to you in other letters (x), where I have declar'd the causes of this exception of mine, in such a manner, that I do not think it necessary to repeat them here.

Nor shall I think this foreign to the truth, that if any orifice of the branches communicating with the aneurism, be in part cover'd by those polypous concretions which are within the aneurism, so that less blood shall flow into it, they may begin, during the life of the patient, to extend themselves into that branch; and that when to the weak motion of the blood out of the aneurism, is added that extreme languor of the heart, in dying persons, which now propels the blood less and less, the concretion in this branch may be encreas'd; and finally, that it may be so fill'd up, on all sides, by the viscid and polypous blood stagnating and growing cool there, after death, that no cavity shall remain: and by this means you will more easily understand another observation of Haller (y).

Do not, however, imagine, although I acknowledge that there may be polypi in the dilated arteries, even a long time before death; do not, I say, imagine it to follow from hence, that I should no less acknowledge them in the dilated heart also. For the fibres of the dilated heart are, generally, wont to act more strongly, as Senac (z) shows, from the violence of the palpitations; or if they do at any time act more weakly at length, yet the very small strength of the fibres, in a dilated artery, is by no means to be compar'd, at any time, with the force of these palpitations, in breaking down, mixing, and expelling the blood.

31. I know very well that you may here, with great propriety, ask me this question; to what purpose is it, if there are so few polypi in the living bodies, that not only in all the observations of Valsalva, from which I am not at liberty to take away any thing, but also in mine, always to make mention of these concretions, which were not the causes of death, but the effects? I, however, take notice of them for this reason; in the first place, in order to let you see in fact, that what Schacht, the preceptor of Zollcosterus (a), said, is also true in Italy; I mean, "that a polypus was so far from being a rare thing in Holland, that it seem'd to him to be something extraordinary, if he found none in those who died of a disease:" and when you have seen this, you will the more readily believe, that the polypus, of which there were not the least symptoms in the persons when living, had been form'd after death..

(x) *Epist.* 17. n. 29.

(y) *Opusc. cit. Obs.* 19.

(z) *ch.* 8. *cit.* n. 5.

(a) *Dissert. cit.* § 3.

And in the second place, notwithstanding the polypus has been form'd in the dead body, yet the absence or presence, and various condition of the polypus, shew, at least, what was the nature and quality of the blood, in the living body. Finally, there have been observ'd, by Malpighi (*b*), to be some differences betwixt those polypi which are form'd on the right and on the left side of the heart, though partly call'd into question by Pasta (*c*). For Malpighi had said, that those on the right side were, for the most part, of a whitish colour, and those of the left, of a black; the former, of a larger size; the latter, of a lesser. Pasta, however, doubts as to the colour; though as to the magnitude, he does not disagree. If you consider the reason given by Malpighi, of the chyle and lymph that is just added to the blood, going to the right sinus of the heart, and the largeness of this sinus, you will be inclin'd to grant to Malpighi both his propositions; but still more the greater bulk of the polypus, on the right side, when you at the same time attend to this, that the right ventricle is weaker than the left; so that it cannot press upon, and expel, the blood, but with less force; and must soon after be the more easily relax'd and distended, as by reason of respiration being more and more deficient, in the last extremity of life, it throws out less blood than it receives.

But in order to come, more certainly, to the truth, observations must be collected. And this was done by Pasta, as I have said above (*d*), in respect to the colour, for which reason he could not assent to the opinion of Malpighi. In regard to the magnitude of the polypi, I have done it myself; and having examin'd into all the observations contain'd in Pasta's letter, that are in great number indeed; some of which are produc'd for one reason, and some for another; I have really seen that the polypus had been the largest frequently in the right, and very rarely in the left; and I have even observ'd, that it is very often taken notice of in the right ventricle only, but very seldom in the left ventricle alone. Nor indeed will you find, that Val-salva was accusom'd to find it otherwise, if you read over all his histories, especially those which I have compriz'd in the twentieth letter. And he made no hesitation to predict, in dependance upon his long series of observations, as you will learn from my eleventh letter (*e*), that when he had happen'd to see a polypus taken out by me on the left side of the heart, another would be found on the right side; nor did the event falsify his prediction.

In order, therefore, more certainly to determine upon distinctions of that kind, and others besides; as that, for instance, which Malpighi has added (*f*), in regard to the substance of the polypus being more dense on the left side, than on the right; that their causes, which may be sometimes useful in the very violent controversy about polypi, that I have taken notice of above, may be enquir'd into, you certainly perceive that the circumstances which have been seen in the several dissections, in regard to these polypi, have not been remark'd in vain: and I even with that, in general, we could have done it with more accuracy.

(*b*) Dissert. de Polypo Cordis.
(*c*) Epiſt. ſep. cit. n. 14. & 23.

(*d*) n. 22. in fin.
(*e*) n. 22. (*f*) Dissert. cit.

32. But to return, at length, to the inequality and intermission of the pulse; whether polypi are or are not to be allow'd of in the heart, before death, it appears from those things which I have now and then interspers'd, that this admonition of the celebrated Fantonus (*g*) is very just: "I say again, we must beware not to form a rash and imprudent judgment, in regard to polypi from disorders of the pulse. For it certainly deceives many. Let the dissection of bodies render us more cautious. For you find polypi; yet the pulse was equal and constant: polypi are wanting; yet every kind of disorder was found in the pulse."

However, all the disorders of the pulse are found out, as you very well know, by attending to a number of pulsations, or to each of the separate pulsations. By attending to a number, and by comparing one with another, in respect to every distinction, the inequality is distinguish'd; and as to the number within a certain time, the intermission; and if this last a very long time, the asphuxia; properties, of which I have hitherto spoken; and besides these, the frequency or the rarity. And by attending to the separate pulsations, the quickness or the slowness, the hardness or the softness, the greatness or the smallness, the vehemence or debility, or any other properties of the pulse, are to be distinguish'd; if, however, any other there are to be added to these; for I confess that, in this part of medicine, the ancients have been too prolix. And yet, if on the other hand I should say, that some of the more modern physicians have been more sparing than they ought to be, you, perhaps, would not think that I said it without reason. For it certainly does not follow of course, that all frequent pulses are swift or quick, nor that all hard pulses, or all great pulses, are vehement; which they may be thought to have attended to but little, who have omitted the quickness, the hardness, the too great magnitude, and the disorders that are diametrically opposite to these. But the celerity or slowness "cannot be distinguish'd by the touch," in the point of time which one pulsation continues. And this I certainly confess with Bellini (*b*), "in a state of pulse which recedes but little from the natural one." But can they not be distinguish'd when the state of the pulse is very different from the natural state? And if they can, by what name then would they have this kind of disorder call'd? since they have, without the least necessity, now confounded the terms of celerity and frequency, slowness and rarity, by a promiscuous use of them, which, among the ancients, were prudently and properly distinguish'd; and this modern custom is not approv'd of by Stahl (*i*). For with them we should certainly be thought to say things diametrically opposite to each other, if we should say that we had found a celerity, join'd together with a rarity, in the pulses of patients. Yet this has sometimes happen'd; and never more than in a young man, in whom I found no great rarity of the pulse, but the greatest celerity imaginable. He was one of those who dress hemp, and was, through a hypochondriac affection, of a timid nature, but robust: he lay in the hospital of St. Mary de Morte at Bologna, in the beginning of May, in the year 1705. Blood had been taken away three times, which, I remem-

(*g*) in Schol. ad Patris Obs. Med. Anat. 27.

(*b*) De Pulsibus.

(*i*) Excus. resp. Exam. Puls. celer. & frequ.

C. 4.

ber, was not only without a crust, but even coagulated slowly, and with difficulty; or at least that which was taken away the second time. On the second and the third day the spitting was bloody, and after that there was none, or nearly none; but he had frequent nocturnal sweats, which were at first of no advantage; yet about the tenth and eleventh day, they were so far of advantage, that the pulse, which had been chord-like, and very frequent, as was natural to an acute fever, was on the eleventh day, when this fever was at an end, no longer tense nor frequent, but even rare, yet not immoderately so. But with this rarity, a vibration or tensity was soon after join'd, and so great a celerity, that although both motions of the artery, that is, outwards and inwards, did not take up, when taken together, much more time than they generally do when in a natural state, yet the first was three times shorter than the second. And this circumstance continu'd about two days, until the watchings and the thirst, which even then remain'd, by degrees going away, the pulse also, having its vibration and its celerity diminish'd, return'd gradually almost to its natural state, as we perceiv'd on the fourteenth day.

33. But I have found a still much greater rarity without any celerity or slowness, particularly in two old men, from the time that they had been first attack'd with epileptic paroxysms, beginning from the belly. The history of one of these I have written to you already (*k*): and of the other I shall, perhaps, send you the history at some other time (*l*); whom visiting by way of consultation, I found with such a rarity of pulse, that within the sixtieth part of an hour the pulsations were only twenty-two; that is to say, they were in number only about two-thirds less than they ought to be; and this had been so already for many months.

You will see, indeed, in the Sepulchretum (*m*), that Rumlerus had observ'd many fewer pulsations in a young man, as "a sign of the greatest dejection of strength," join'd with a slow fever. But neither of them of whom I speak had any fever, or such a dejection of strength but that they could rise from their bed; and if they could not always "walk about like healthy persons," as that nobleman of Vesalius (*n*) did, at least they could sometimes. Yet in these very persons the pulse, for the most part, was not unequal, nor various, whether you examin'd it in one wrist or in both; as it was in the young country-fellow whom I saw at Bologna, in the hospital of St. Mary de Vita. This boy, having formerly fall'n from a tree, and bruised his back, when he was twelve years of age, and having made at that time bloody urine, was attack'd with a continual palpitation of the heart, which troubl'd him even then, though it was nine years after, and was wont to be exacerbated three or four times every year, and bring with it a difficulty of breathing, which had then happen'd. As I, therefore, tried both the wrists at the same time in this young man, I found the pulse in both places unequal and irregular; yet in such a manner, that it was manifest, when I attended to the greater part of the pulsations, that in the left wrist they could neither be call'd rare nor frequent, and that in the right they were almost

(*k*) Epist. 9. n. 7.

(*l*) Vid. Epist. 64. n. 5.

(*m*) Sect. hac 9. in Schol. ad Obs. 2.

(*n*) In cit. 2. Obs.

three times more rare than in the left. If this young man had happen'd to die at that time, I should, perhaps, have found something which would have been of use in order to understand the cause of this difference, provided it had not consist'd in the structure of the nerves, which go to the right artery, being vitiated from the fall. For I believe that many disorders of the pulse arise frequently from the nerves, and those in particular which are more difficult to be explain'd. For that "languid and pretty rare" pulse which you see is in the Sepulchretum (o) ascrib'd to a great quantity of turbid water in the pericardium, was not rare to so great a degree, as appears from that very method of speaking; nor was in one arm only; and therefore may, perhaps, be sufficiently explain'd from the causes there propos'd: although out of so many not dissimilar observations of water contain'd in the pericardium, which I have often produc'd, or taken notice of, I know not how many at length make mention of a rare, rather than of a frequent pulse, which had preceded. And the explication of the frequent pulse seems very easy, whether some irritating cause vellicates the nerves of the heart, or the heart itself, and that either internally or externally: externally, as when there is acrid water in the pericardium, to which the thirteenth observation is referr'd in that very ninth section of the Sepulchretum; and internally, when the blood that is pass'd through the cavities or substance of the heart, is of such a kind as to be able to vellicate; or even when the passages of those nerves through which the spirits flow into the heart, lie open so wide, after a long irritation of the heart, that, when this irritation is taken away, they go on nevertheless, and for a considerable time flow more frequently into the heart than they ought: which, perhaps, is the reason why it frequently happens, that, when fevers are already overcome, the patients, notwithstanding, if you attend to nothing else but the frequency of the pulse, seem to be still feverish; and for that reason are, by timorous physicians, confin'd longer and longer to their beds; whereas they ought to be dragg'd out of them by degrees, and in proportion to their strength, if we would indeed wish them to recover.

But the hardness of the pulse has, for the most part, so manifest causes, that they evidently appear of themselves; and it evidently appears, likewise, why it is less to be attended to in old men, unless perhaps it be either too large, or they have, contrary to the generality of old men, their flesh even at that time somewhat soft, and, as it were, tender.

And if the cause of the magnitude of the pulse were not extremely evident, it might be conjectur'd from those things which I have touch'd upon above (p) in several places, when I treated of the disorder directly contrary to it: nor, indeed, is there leisure to dwell upon it here, where you see I point out certain causes by way of example, as it were, of the several differences which seem to me the more certain; for I have shewn above (q) what the fountains are, from whence you may, when you think proper, draw, not only a greater number of observations, but such as are more accurate. At present, this one thing only remains, that we enquire in regard to the vehemence of the pulse. For although, when I spoke of the *alaphuxia* and

(o) Sect. cit. Obs. 19.

(p) Ut n. 15. 19.

(q) N. 12.

the debility of the pulse, I pointed out some causes, the opposite of which must of course bring on a vehemence in the pulsations; yet it sometimes happens, that there is so great a vehemence, and join'd with such circumstances, that the peculiar cause of it, if it should chance to fall under the notice of the senses, must, according to appearances, be enquir'd into in the bodies after death: and this I did in the man whose history will be immediately subjoin'd; so that, as I began with asphuxia, and ran over all the intermediate disorders, I shall end my letter with the disorder which, of all, is the most contrary to it.

34. A shoemaker, of a middle age, who, as he said himself, had been accustomed to no irregularity, except that of drinking too much wine, had begun, about four months before, to be attack'd with a lassitude of the whole body, and a pulsation in the region of the heart, join'd to a difficulty of breathing. And these symptoms increasing every day, Paul Salano, a most experienc'd physician at Bologna, judg'd that the man labour'd under an aneurism, and order'd blood to be taken way from him more than once. At length, swoonings were added to the symptoms I have mention'd, when he was receiv'd into the hospital of St. Mary de Morte, at Bologna. These swoonings, and the difficulty of breathing, were more violent in the nighttime, and especially when the patient endeavour'd to go to sleep; and when these symptoms attack'd him, his right arm was seiz'd with a grievous pain, just as if it were torn to pieces. And so great and so constant a pulsation was there at the region of the heart, and from thence quite to the navel, that I scarcely remember ever to have felt or to have seen a larger. For the whole of it was perceiv'd by the eye; and although it was the most considerable in the breast, yet that part of the belly, also, which I have mention'd, struck the hand, when laid upon it, in such a manner, that there seem'd to every one to be an aneurism, not only in the thorax, but in the belly also. The patient himself said that he perceiv'd this pulsation everywhere; so that it came even down to the extremity of his feet. And, indeed, the carotids also, and the temporal arteries, and the radials, which I often felt, were agitated with the same large and vibrating pulsations. The feet were somewhat swell'd. Scarcely any food was taken down. And although there was no fever, and though the patient could, when his respiration was become less difficult, lie down either upon one side or the other, and was extremely well in his head; yet he bore his disorder so extremely ill, as to think that death was much more desirable to him. And this desire he was satisfied in, on the fourth day from his coming into the hospital. For having happen'd to rise in order to go to stool, he was scarcely return'd into his bed, when he could not take his breath but with his neck stretch'd out; and in that difficulty of breathing he died.

I dissected his body on the first of July, in the year 1705; observing, as we dissected, that the lips were very livid, and the blood, which flow'd down while we cut through the integuments about the throat, black and fluid.

The thorax being open'd, a yellow serum was observ'd to be contain'd in its right cavity. In the left, the whole convex surface of the lungs adher'd to the pleura, by a thick and soft kind of membrane that was interpos'd, and which could be separated without laceration on one side from the membrane

brane of the lungs, and on the other from the pleura; the relics and token, in my opinion, of a peripneumony, which had formerly preceded. The lungs themselves were found. In the pericardium was a little turbid water. The heart was rather large, but only moderately so. In the cavities and vessels of it, which communicated with each other, was no-where any thing polypous; the blood was only black, and slightly collected into coagula. Notwithstanding I carefully examin'd into every circumstance, I could but just observe, in one of the three valves that are plac'd at the beginning of the pulmonary artery, something hardish, and approaching to the nature of a cartilage, in the middle of the valve, and especially at its edge. However, there was no dilatation of the heart, or of the auricles, or of any of the vessels, either in the thorax or belly. And, indeed, although I open'd the aorta, from the heart quite to its division into the iliacs, I could not observe any preternatural appearance on its whole internal surface, except a slight and unequal kind of fulci, as it were, drawn in a longitudinal direction; and those, first, from the very beginning of the artery quite to that part which begins to adhere to the vertebræ of the thorax; and again, but more slightly, where it gives off the cæliac artery below the diaphragm.

The belly being open'd before, I examin'd into the last-mention'd circumstance; and no inconsiderable quantity of yellow water being seen in it, we observ'd that the colon, from the liver quite to its termination, was contracted into very narrow cells, and that the stomach also was much contracted; but neither of these appearances surpriz'd us, as they were in a man who had scarcely taken any thing, as I have said, for many days. Wherefore nothing preternatural was found in the viscera of the belly, except that the liver was somewhat hard, and mark'd with spots on its external surface, resembling a kind of small granules. The brain, which was the only part remaining to be examin'd, I found to be in a very sound and natural state; although it was not very difficult to draw off the pia mater from the cortical part of the cerebrum without injuring it. Finally, from the tube of the vertebræ I saw no water at all proceed.

35. From whence, then, could so great and so vehement a pulsation of the heart, and of all the arteries, arise? Without doubt, from the same cause that it arises in most of those persons who are beginning to be attack'd with an aneurism of the aorta. For in these persons, it is not from the aneurism itself, which is not yet form'd; and if it were form'd, it would then rather diminish the impetus of the circulating fluid, as we see in the dilated channels of rivers; but it is from that cause which, either alone or with others, produces the aneurism itself, by violently urging the parietes of the vessels, by weakening them, and, finally, by compelling them outwards. And that cause consists in the preternatural increase of the force with which the heart thrusts the blood into the beginning of the aorta, and this into the next part of the artery, and so on in successive progression; especially when the blood is in such a quantity, and of such a quality, that it cannot only have that very violent motion communicated to it more easily, but can more vehemently transfer it to the parietes of the arteries. What, then, more increases the force of the heart and arteries, than that method of diet which immoderately increases the quantity of more vivid spirits, and, if you will

also, the quantity of more irritating spirits? At least, I have seen, that a pulsation of the arteries of this kind has succeeded to such a method of diet; and not only in this man, but even in others, and in particular in one by whom I was consulted about forty years ago.

I have seen the same thing in others besides; among whom was an honest old man, my fellow citizen, and two merchants, the one a Paduan, and the other a Venetian; the latter of whom still lives in a flourishing time of life, but the other died of the disease: yet we could by no kind of entreaties whatever, obtain a permission from his wife that the body should be open'd. That all these persons were given to drinking, I do not believe; and that one of them was not, I even know. Yet I should believe, that in all these persons the pulsation had been owing to the nerves, as there were no particular signs of other diseases; or if there were, they either pretty clearly related to the irritated nerves, as I shall shew in the case of that Venetian merchant on another occasion (*r*), or to such disorders as could not bring on that pulsation but by irritating the nerves; as you will understand hereafter from the dissection of the old man (*s*) whom I just now spoke of, and who died from the irritation of calculi in the kidneys and bladder. But I am confirm'd in my opinion from other observations also. For besides that one is extant (*t*), in which, after a pulsation in the brain, a palpitation of the heart and arteries came on, which was perceiv'd even at the fingers ends; and besides that Rhodius suspected this disorder to be from the uterus, in a matron of Padua (*u*); and although you may ascribe it thereto, in a servant-maid whom the same author mentions (*x*) as being cur'd by Platerus (*y*); I enquire of you, in what manner a flaccid heart can by its own force make such pulses as are in themselves not weak?

Yet in the husbandman whose history I have describ'd to you in the eleventh letter (*z*), the heart was flaccid, and the pulse vehement. Without doubt, because in proportion as his cerebrum, in the state it is there describ'd in, was able to secrete the fewer spirits, the greater quantity was secreted by the cerebellum; or, if you chuse rather to consider it so, by the spinal marrow, and sent to the heart; or else, together with a resolution of some nerves, the irritation of others, as frequently happens, was join'd, and amongst them of the cardiac; or, at least, something of that kind was the case. And to make use of the observations which take notice of a great pulsation of all the arteries, I beg of you to turn to those two which are related in the Sepulchretum, from two very celebrated Parisian authors. One is that of Balionius (*a*), in a young man who had long been affected with a palpitation of the heart, and in whom "all the arteries were seen to have an evident pulsation in almost every part." The other is that of Parey (*b*), in a certain dealer in cloaths, who "said that he perceiv'd a pulse from the impetus of "all the arteries when in action." In the first, "all the valves of the

(*r*) Epist. 64. n. 10.

(*s*) Epist. 42. n. 13.

(*t*) *Commerc. Litter. A.* 1736. Hebd. 32.

n. 3.

(*u*) *Cent. 2. Obs. Med.* 40.

(*x*) *Ibid.*

(*y*) *Obs.* 1. 2.

(*z*) *N.* 11.

(*a*) *L. 2. S. 8. Obs.* 26. § 2.

(*b*) *Secd. hac* 9. *Obs.* 9.

" heart,

"heart, and the great artery, were found to be distended to such a degree, "that the heart seem'd to be three times larger than its natural size, or at least twice as large." And in the dealer in cloaths, "the arteria venosa" was found dilated to so large a size, as to admit a clench'd fist, and its internal coat was bony." And now I ask of you, whether the distensions and dilations of the vessels increase the impelling force of the fibres, and the impetus of the circulating humour? or whether they diminish both the one and the other, as was just now hinted at? And if you allow of this, it will therefore seem more probable, that the same cause which had before produc'd the aneurisms in both the one and the other, had even continu'd to act when the aneurisms were form'd; and even that it had been so strong, contrary to what generally happens, as to keep up that very great pulsation of all the arteries.

36. And I made use of the plural word *aneurisms*, in order to include the observation of Parey also; first, because he us'd this very word, *aneurism of the arteria venosa*; and, also, because it is doubtful with me, lest he should, perhaps, have written thus through carelessness, when he really meant to write *vena arteriosa*, that is, the pulmonary artery. And there are many reasons for doubting. For, in the first place, in the histories which I remember to have read, and which are in all two in number, of a very great dilatation of the arteria venosa, that is, of the pulmonary vein; this very great and universal pulsation is so far from being mention'd, that either nothing is said of the pulse, or it is said to have been very small and weak. One of them is given by Hildanus, century the second, observation the eighty-ninth; and not, as is falsely pointed out by the printers of Lancisi (c), the ninety-ninth: and the other by Vieussens, in his treatise of the heart, which is written in French, chapter the sixteenth. And, indeed, it has so happen'd to me, that when I have found the trunk of this vein, that is, the sinus into which all its branches flow, larger in its size than was natural, I heard that a languid pulse, or no pulse at all, had preceded; as you will learn (e) from reading over again the eighteenth letter (d). I also read, that in both of those observations, a palpitation of the heart, and a difficulty of breathing, had been remark'd; which I not only see are not mention'd in the observation of Parey, but I ought to believe were absent; since I observe that the patient of whom he speaks, was "playing at tennis" in his last hours; which kind of exercise, by exacerbating both of these symptoms, would have caus'd uneasiness instead of pleasure. On the other hand, I find in the same observation, which does not occur in either of those two before-mention'd, nor does it seem reasonable to expect it, in the dilatation of this vein, that "a painful and tumid place" should appear externally. This is generally observ'd to happen from the pulsation either of the dilated heart, or of its arterial vessel when dilated; and it is much more frequent in the latter than in the veins, that "the internal coat" is found to be "bony;" although I do not very well understand with what propriety Parey could have said even this of a vein, as he had asserted (f), "that a vein consisted of one coat only;" and that it did not, like the arteries, "obtain two coats."

(c) De Aneur. P. op. f. 53.

(e) Vid. etiam Epist. 64. n. 7.

(d) N. 2. & 34.

(f) Oper. l. 2. c. 10.

You see, then, what the circumstances are, in his observation, which give me occasion for doubt. Yet they do not, altogether, absolutely influence me to believe, that he meant to write “*vena arteriosa*,” for, on this supposition, difficulties would also remain; not so many indeed, yet some, however, of those that I have hinted at. It does not escape me, indeed, that there have been instances of the dilatation even of this vein, that is, of the pulmonary artery, although much fewer than of the great artery: as in that plate of Riva (*g*), for instance, in which the dilatations of all the larger vessels were first represented; and in that very history of Vicussens, which was refer’d to just now; and in the work of Kerckringius (*b*); and to insist upon those observations which have the preceding signs, and are extant in the *Sepulchretum*, Alardus Mauritius Egerdes (*i*) describes “a preternatural magnitude” of the pulmonary artery, “as if it were affected with an aneurism, and having sacculi hanging to it, here and there, that were turgid with coagulated blood:” and if the observation of the scholiographer of Hollerius (*k*), “of an abscess” in the same artery, which Poterius (*l*) also says he had had an opportunity of observing, “in many,” is not to be refer’d to in this place. Cæsalpinus (*m*) undoubtedly, however, gives an account of “the artery that leads into the lungs being twice as wide as it naturally is.”

For take care how you believe with Bonetus (*n*), that he had thus spoken of “what is commonly call’d the *arteria venosa*, and by moderns, the pulmonary vein;” he, I say, who, in the *Questiones Peripateticæ* (*o*), taught these very moderns to speak as they now speak; and who, in that very sixth book of his *Ars Medica*, before he wrote this observation, being always consistent with himself, has twice affirm’d (*p*), that what the ancients had call’d “*vena arterialis* was, in every respect, a real artery;” an artery, I say, “which leads into the lungs;” whereas there is “a vein,” which they call’d “*arteria venalis*, leading from the lungs” into the heart. Now then see, that in the reverend old man, of whom Cæsalpinus speaks, there had been, together with the dilatation of the pulmonary artery, not only a palpitation of the heart, but also a manifest external place, by reason of two ribs being broken away from their cartilages, in which the breast was, alternately, rais’d into a tumour. Nor was a palpitation of the heart wanting in the observation of that scholiographer, if it really belongs to the present question: and this Bonetus may seem to have forgotten, when, referring a part of the same observation, as I think, which certainly relates to a syncope that happen’d to Antipater, to an inequality of the pulse (*q*), he has oppos’d to the observation (*r*) the conjecture of Saxonia, inasmuch as this author was then speaking of a man who was still alive: and whether I am deceiv’d in this opinion, you will determine when you have again look’d over those things which I have now hinted at, in Saxonia himself, and that scholiographer, not in chapter the third, but in chapter the thirtieth.

(*g*) Eph. N. C. Dec. 1. A. 1. Obs. 17. litt. R.

(*b*) Spicil. Anat. Obs. 16.

(*i*) Sepulchr. l. 2. S. 5. Obs. 4. in Addit.

(*k*) Ibid. S. 8. Obs. 27. § 1.

(*l*) Insign. Curat. & Obs. Cent. 3. c. 22.

in fin.

(*m*) Sepulchr. Obs. 27. modo cit. § 2.

(*n*) in Schol.

(*o*) l. 5. qu. 4.

(*p*) c. 9. & c. 19.

(*q*) l. 2. S. hac 9. Obs. 6.

(*r*) in Schol.

And as to what relates to respiration, that this would be less difficult when there is an impediment, that is, a dilatation at the beginning of the pulmonary artery, than when there is one at the termination of the vein, is not only demonstrated by reason; but also from what Bellini has taught (*s*), and from what Albertini (*t*) has observ'd, may be fairly concluded (*u*). But in many of the observations of the dilatation of one, or of the other vessel, which are pointed out, there were other diseases in the heart particularly, from which some of the symptoms that were present, might have been, in great measure, accounted for, as well as the absence of others; and in the observation of Alardus, none of those things which are taken notice of above, is extant. I grant it; and for this reason I said, that I hesitated. But nevertheless, the more I weigh all the circumstances, and the more frequently I read over again the history of Parey, the more I am under a necessity of suspecting, that some things are left out, at least, which might lead us to understand some of the symptoms; and among the rest, that vehement pulsation of all the arteries in particular.

37. But to return to the cause of this pulsation, and the history thereof, which I have describ'd; if you suppose this history not to be wrongly explain'd by that cause; you first perceive, that we ought, so much the more carefully, to counteract the beginnings of spurious aneurisms, as Lancisi calls them (*x*); as it is more manifest, that even before a true aneurism is produc'd, swoonings, and an intolerable weight of disorder, and even death itself, is sometimes brought on by the cause of the aneurism: all which consequences might be avoided by a proper method of cure being begun early, such as was made use of in those of whom slight mention has been made above (*y*), from Platerus, and the *Commercium Litterarium*; and particularly that mild method of treatment similar to those of Lancisi, which our *Bonhomio Prævotius* (*z*) applied: and indeed how much diet alone is capable of doing, in these cases, is hinted by Ballonius, in these very few words (*a*): "A certain person had an evident pulsation of all the arteries. And what was equally wonderful, he was cur'd by a course of diet."

In the next place, you see of what kind the beginnings of those aneurisms in an artery are; I mean, those which arise neither from the original weakness of its coats, nor from erosion, and still less from a wound or contusion. That is, a vehement impetus, by which the blood, from the too-much-augmented force of the heart and arteries, is urg'd for a long time into these vessels; and finally, by so frequent and repeated a violence of its strokes, and by the very considerable distensions, begins to injure their sides, although in themselves sufficiently firm, by so drawing asunder the villi of their internal coat, which are very slender indeed, but very closely compacted together, that the first injury discovers itself in the form of the sulci, which I have describ'd. After this, other injuries follow in the next coat, sometimes sooner, sometimes later, in proportion as the impetus of the blood is greater,

(*s*) De Morb. Pector.

(*t*) Comment. de Bonon. Sc. Acad. Tom. 1. in Opusc.

(*u*) Vid. tamen Epist. 64. n. 7. & 8.

(*x*) De Aneur. Propos. 5.

(*y*) n. 35.

(*z*) apud Rhodium Cent. 2. Obs. Med. 40.

(*a*) Paradigm. 15.

and the firmness of the artery less; or as the impetus of the blood is less, and the firmness of the artery greater: and a true aneurism is at length produc'd, either expanded on all sides, or hanging like a sac on the side of it, according as the distraction of the villi is made equally all round, or on one side only. Thus reading over again, in the eighteenth letter (*b*), the appearances which I have describ'd in the great artery of a certain woman, you will find, that sulci of this kind are drawn in a longitudinal direction, in that part of the artery which had not yet been dilated: and that above, in a certain place, just as if it had been more distracted, the fibres of the artery itself had appear'd; in which place we may, without doubt, reasonably suppose it would have happen'd, if the woman had liv'd longer, that the artery must have grown out into the form of a sac: and finally, that almost from this place, quite to the heart itself, the coats of the artery were already expanded on every side. Nor need it be a cause of any hesitation to you, that the pulse in this woman could not be perceiv'd. For it was not certain whether it was always so or not; and if that did happen in the limbs by the force of the convulsions, so much the greater might the impetus of the blood upon the coats of the aorta itself have been, for this very reason, because it was compounded of "the encreas'd direct and reflected impetus," as is demonstrated by Lancisi (*c*).

And suppose me to say the same things of that other woman, in whom there were lines in the aorta, not unlike those sulci, and, at the same time, a somewhat obscure pulse in the wrists, as you will find in the twenty-third letter (*d*): and that I say them so much the more, because in her there was a great palpitation of the heart, and the pulsation of the vessels in the neck was obvious even to the eye. And although it is uncertain what kind of pulse there was in others, whose great artery I found furrow'd internally; yet nothing forbids us to believe, that it had been more vehement, and internally in particular, than the nature of those bodies requir'd: and in some of them, indeed, it is probable, as in the priest of whom we spoke in the fourth letter (*e*), and in the Venetian woman, of whom I shall speak in the twenty-sixth (*f*), whose aorta shew'd more remarkable sulci than any other, join'd with dilatation, and in a certain place also with erosion. For in the progress of the disease, through its several stages, another cause is frequently added to the impetus of the blood, which cause has the power of eroding, and from whence the beginning of a true aneurism may be accelerated, as Lancisi rightly observes (*g*), and Fernelius has, in general, hinted (*b*). And with what kind of injury the cause of a spurious aneurism, before it become a true one, that is, before the artery is dilated from the impetus of the blood (the sign of which is taken from the pulsation being made wider from a more narrow state), begins to vitiate the artery, I think is now plac'd before our eyes; and it is at the same time demonstrated, that even at this state of the disease, a man may be sometimes very grievously tortur'd from the same cause, and depriv'd of his life. And those things, if you think proper, you may add to what Lancisi has taught: in the mean while farewell.

(*b*) n. 34.(*c*) Oper. modo cit. Prop. 36.(*g*) Oper. cit. Propos. 39.(*d*) n. 6.(*e*) n. 21. (*f*) n. 21.(*b*) Patholog. l. 5. c. 12.

LETTER the TWENTY-FIFTH

Treats of Lypothymia, and Syncope.

1. **T**HE asphuxia, as is shown in the preceding letter (*a*), may be without a syncope: but not a syncope without an asphuxia. The former is very difficult to be understood: the latter very easy. For it is not at all surprizing, that they who lie like dead persons should have the pulse, as well as all the other signs of life, wanting. On the other hand, you cannot sufficiently wonder, that in those persons, in whom you find no motion of the arteries, the greater part of those faculties and powers which we see in living and even in healthy persons should still continue and be vigorous. It is more easy therefore to treat of the syncope, than of the asphuxia: nor is it very difficult to treat of the lypothymia, inasmuch as it differs from the syncope only in degree. The causes of both these complaints, which have offer'd themselves to Valsalva and to me in dissections, you will learn from this letter. To Valsalva they have appear'd as follows.

2. A young man of eight and twenty years of age, tall in stature, fat, naturally of a red face, and subject to a frequent pain in the stomach; who seem'd, when he held his head downwards and inclin'd his body, to feel something going from his stomach to his fauces; and who, sometimes, by reason of weakness, mov'd himself laboriously, and breath'd with anxiety; and had twice fainted away, to such a degree as to seem dead; and frequently complain'd also of a pain in his head and vertigoes; and having, some months before, lost his usual fatness, but still preserv'd the red colour of his face; at length, on a certain day, return'd home in the evening, fatigu'd and troubl'd with the usual pain in his stomach: he anointed the region of his stomach with petroleum, supp'd and pass'd the night in placid rest; so that when he wak'd in the morning, and was ask'd by his wife how he did, he answer'd he was very well. He rose to go to stool. While he went to bed again, he was seen by his wife to be scarcely able to lift up his feet, to stagger, and almost to faint. At length to bed he came, and immediately threw himself into it, just crying out once only, Oh I am exceedingly ill! He was very red in his face, he afterwards grew pale, show'd some slight inclination to vomit, his fœces and urine both came from him, and he died in a short time.

The face of the dead body, and the neck at the sides of the larynx, were tumid and livid. The belly being open'd the chyliiferous vessels were

seen through the mesentery; as from supper to the time of his death about six hours had been interpos'd. The spleen was twice as large as it naturally is. And the stomach, on the side of it which is turn'd towards the spleen, was so thin that it did not even equal half of that thickness which it had in other parts; and in the same place, at the upper part, was internally distinguish'd with many bloody points. In the cavity of the stomach was a yellowish matter. The thorax being open'd, nothing was found to be worthy of remark, except in the heart, the right auricle of which was dilated to such a degree, as to equal a third part of the heart itself: the right ventricle contain'd a large quantity of fluid blood, and with it a small siz'd polypus, differing much in its nature from those concretions which frequently occur in bodies that a fever or other disorders of the like kind have carried off. For it was of a much thicker substance, and differently compacted from what it is in these persons, and of a colour like flesh. The top of the cranium being taken off, while the dura mater was cut into, serum issu'd forth, to the quantity of two ounces: a little quantity of which was also found in the ventricles of the cerebrum; but they were in other respects sound.

3. Although this history relates to the diseases of the stomach, head, and heart, I chose rather to put it among the last, for this reason, because the two foregoing swoonings, which were so considerable as to make those who were about the young man suppose him to be dead, seem sufficiently to show of what kind the last disorder was whereof he really died. For whatever was the manner in which the beginning of this last attack came on, and however the head and the nerves might conspire thereto, there is nothing which greatly forbids us to suppose that it ended in a syncope: and this is confirm'd by the succeeding paleness of the face, nor rendered less probable by the exit of the feces and urine, inasmuch as the relaxation of the sphincters is also, sometimes, common to the syncope. Without doubt a great disorder was found in the heart. Nor do I say this on account of that little polypus, as, whatever the substance, structure, and colour of it might appear to be, we ought not, for these reasons, to be unmindful of what I have expatiated upon in the former letter (b). But I say it on account of that very great dilatation of the right cavities of the heart. For unless that ventricle had been much dilated, it could not have contain'd a large quantity of blood: nor, as this cavity was turgid with so great a quantity of blood, could the dilatation of the neighbouring auricle be otherwise than very considerable, which was equal to the third part of so large a heart. And that, when the cavities of the heart are enlarg'd, it is not unusual for faintings to happen; you may not only learn from the observations of Albertini (c), who accounts for them from dilatations, "in particular, of the trunk of the vena cava, or of the right auricle of the heart, so that they sometimes terminate in a syncope of the heart;" and from the eleventh observation which is in the tenth section of the Sepulchretum, and relates to the present subject; and from others, perhaps of the same kind; and finally, from that which I have, also, had occasion to speak of elsewhere, of Grassius the younger (d), in regard to a woman who was subject to the

(b) n. 30. & aliis.

(d) Eph. N. C. Cent. 5. Obs. 24.

(c) Comment. de Bonon. Sc. Acad. Tom. I.
in Opuscul.

frequent return of lypothymiaë, and who dying, at length, so suddenly, as scarcely to be observ'd by any one, and being taken for an apoplectic person, fear'd no mark of disease, to those who examin'd the body, in any part, except in the right auricle of the heart, which was twice as big as it usually is; I say, you may not only learn from those observations, but also from some of mine; as from that which is given you in the preceding letter, of the hemptresser (*e*), and from that in the eighteenth letter of the shoemaker (*f*); in regard to both which persons, if you should say, as they were subject to these faintings, that their life was taken away by a syncope, I should readily consent to your opinion. But you will, moreover, read in the same eighteenth letter, two other observations (*g*), which you may compare with this of Val-salva; and you will also find it explain'd (*b*), how the heart, when dilated, may at length easily sink under the oppressive load of the blood, and bring on a speedy death, especially if any cause be added from whence the expulsive forces thereof are diminish'd. The cause of which circumstance you may easily account for, in this young man of whom we speak, from the nerves either being convuls'd by the acute pain which suddenly seiz'd the injur'd stomach, or from that water which had been almost instantaneously extravasated under the dura mater, or at least almost instantaneously increas'd, and which compress'd all the parts within the cranium; the nerves being either so press'd upon, or, in part, depriv'd of the influx of spirits, that they could no longer be equal to the task of preserving the motion of a heart so diseas'd. Wherefore, the blood being accumulated in the right cavities of it, and consequently in the cavities of the vena cava, and the nearest branches of this, the jugulars, stagnated, and brought on that tumefaction and lividness in the neck, at the sides of the larynx and in the face.

4. A priest, of sixty years of age, having been troubl'd about half that time with a weakness of the head and stomach, also with a thirst and sudden faintings, especially when he stood up, together with a streightness of his chest and an intermission of the pulse, at length fell into a double tertian and continual fever; which becoming more acute every day, degenerated into an ardent, and even into a mortal fever.

The abdomen being open'd, the omentum was found to be very large, and was twin'd up in the manner of a rope. The right kidney was wanting, nor were there any traces of its emulgent vessels; the left was of the natural size, and contain'd in it a vessel full of water, of that kind which they call hydatids. Upon examining the chest and its contents, the right ventricle of the heart was found to contain a pretty large polypous concretion, which produc'd itself to a considerable tract through the vena cava: and the left had one of a smaller size that went to the pulmonary vein.

At length, the upper part of the cranium being taken off, which was suppos'd to contain the seat of the old disease, a considerable quantity of water was seen within the ventricles of the brain, and very tumid glandules in the plexus choroides.

(*e*) n. 13.

(*f*) n. 2.

(*g*) n. 8. & 14.

(*b*) n. 3.

If this priet was not the same with that monk of whom Valsalva had spoken to me (*i*), it follows, that he must have twice seen a deficiency of the kidney on one side. And if it was the same, as I suppose, either it should not have been said in his treatise *De Aure Humana* (*k*), that the left kidney was deficient, but the right; or it should not be said here that it was the right, but the left. Be this as it will, however, one or other of the kidneys was wanting; and as that with which the man was supplied had only its natural magnitude, and consequently did not secrete so much urine as two would have secreted; whether, or not, should we account for from thence the greater part of those disagreeable symptoms with which the patient was so long afflicted? or did more water begin to be accumulated in the ventricles of the brain, from the time, at least, that some injury had been further added to the secretion of urine by the internal hydatid, which, if it did nothing else, certainly took something from the bulk of the kidney, that was already less than in proportion to the bulk of the body? For that there had been some quantity of water there before, seems to be argu'd from the weakness of his head, and the symptoms of disorder which relate to his thorax; as in the head nothing was found besides; and in the thorax nothing at all was found by dissection, which you could with justice accuse. But whence did it happen, that he was seiz'd with those faintings when he stood, rather than at other times? Was it because no situation of body tires a man more than standing? Or was it from the weight of the very large omentum drawing down the stomach more at that time, which was already weak? But from what cause was the omentum so twisted up? If it appear'd from the history what had happen'd either internally or externally to the man, besides those things that have been observ'd, from which the omentum might have been long forc'd together into one place and compress'd; I should have endeavour'd to explain it almost in the same manner in which Ruysch (*l*) explain'd the coarctation of the same, and its change into the form of a sausage.

But to return to that which is principally in view here, that is, to swoonings, do not be surpriz'd, if in this man also I cannot explain the cause of them without bringing in some mention of the nerves, since nothing was found, except in the brain and at the stomach, where we may conjecture this cause to have been; and the nerves, when compress'd at their origin, or irritated in any other place, are very frequently, and very evidently, the cause of swoonings. This appears from the great number of faintings with which persons are seiz'd, when suddenly disturb'd by certain passions of the mind, or affected by very ill smells, or seiz'd with the most cruel pains of the nervous parts, and particularly of the stomach. Nor will you imagine that those things which are now controverted in regard to the motion of the heart, as if it did not depend upon the nerves, is an objection thereto. For it is one thing, that the heart may be mov'd, for a time, without the nerves; and another thing, that they being hurt, and particularly being irritated, the motion of the heart cannot be vitiated, greatly diminish'd, and even inter-

(*i*) Advers. Anat. III. Animad. 32.(*k*) C. 2. n. 14.(*l*) Obs. Anat. Chir. 63.

rupted. The first of these was, certainly, known to the most learned Senac (*m*), and understood by him clearly, if it was by any one. But did he for that reason deny the second? If you read over his excellent chapter on the syncope (*n*), you will then see, that he accounts for this disorder sometimes from the nerves being irritated in one place or other, but especially when they are compress'd in the brain, or stimulated there in the stomach. But not to recede from what is found in the dissection of morbid bodies, read the following observation of Valsalva, and then spare to accuse the nerves if you can.

6. A nobleman, who was descended from a father that had been subject to pains of the joints and catarrhs; having been himself, from his childhood almost, troubl'd with pimples and scabies; and in his youth with virulent gonorrheas and ulcers of the penis; and finally, when he was yet young, having been troubl'd with pains of the same kind with those of his father; and being desirous of getting rid of all these disorders, he did not, however, meet with the success he had hop'd. For in regard to those venereal injuries, they indeed easily yielded to remedies, and went off without leaving any traces of a lues hind them. But the pains of the joints, although frequently attack'd by physicians in different ways, and especially by those who, suspecting that there was something venereal in the case, had sometimes given him mercury, at other times decoctions of the woods, and such remedies as excite sweats, could not, nevertheless, be driven away to such a degree, but that they now and then brought more or less inconvenience with them, and left the joints very weak. And in order to strengthen these parts, having us'd to great excess the baths that are near Verona, and the mud of those baths, without any advice but his own rash determination, he was not at all the better, but even soon after began to be troubl'd with pains of the head, not without a sense of plenitude, with inflammations of the eyes, and hæmorrhages at the nose. These inflammations were the most injurious to the left eye; because this having been long affected with a similar disorder many years before, had contracted an albugo, from an erosion of the cornea tunica, which had been much increas'd by this second inflammation, that was equally long with the first, so as to be in some measure prominent; and being directly opposite to the pupil, caus'd all objects to seem double. And the hæmorrhages continu'd very long, a great number of remedies being tried in vain by several physicians, till Valsalva pointed out an easy and simple kind of remedy, which I have sufficiently explain'd on a former occasion (*o*), when I was writing to you of this same nobleman.

But having, afterwards, weaken'd his head more and more with continual cares and very close thinking, a frequent flux of blood return'd, but, as I suppose, from the upper vessels of the nostrils; and in the mean while, a considerable inflammation of the eyes return'd also; and at the same time, a frequent and sudden redness of the face, a sense of heat in the head, and of a kind of weakness at the lower part of the occiput; and all these symptoms were more troublesome when the discharges by stool or urine were di-

(*m*) *Traité du Cœur*, l. 2. ch. 7.

(*n*) *L.* 4, ch. 12. n. 2, 5, 7, 9.

(*o*) *Epist.* 14. n. 24.

minish'd. At length, about seven months before his death, as often as ever he went up stairs, or walk'd pretty fast through a smooth and level place, or mov'd his arms, in particular, in the manner we move them when we put on our clothes, he began, first, to observe that a kind of troublesome sense of cold was excited at the lower part of his sternum. Which sensation was so chang'd gradually, and in process of time, that after a month or two that coldness degenerated into the most acute pain, which seem'd to the patient immediately to ascend to his head; and then his sight, pulse, and senses, were immediately taken away; so that he fell into a swoon. And although, at first, these symptoms only succeeded those motions of the body which I have mention'd; yet afterwards he seem'd to fall into the same kind of fainting paroxysm even without any motion.

But, what is wonderful, he suffer'd nothing of this kind upon some of the more violent motions; as of sneezing and coughing, for instance: nay, they even gave him not the least inconvenience at all. He never perceiv'd any difficulty of breathing; but often a weakness of the head; so that he sometimes seem'd to himself to be ready to fall, if he did not lay hold of something to support him. And often, both by night and by day, convulsive motions sometimes seiz'd the whole body; and at other times a part of the body only, particularly the eyelids and the left arm: at one time, a convulsion seiz'd one of the fingers of the right hand with pain; at another time, a stupor seiz'd the same hand, and the whole of the leg on the same side of the body: sometimes the faculty of feeling was entirely deficient in both arms, and sometimes both of them were affected with pain: there was frequently, also, a pain in the scaput, or a sense of constriction at the occiput. And all these symptoms, promiscuously, troubled the patient even to the very day of his death. However, even to that very day, an appetite for food, good sleep, a natural colour of the body, and the chearfulness of his intrepid mind, continu'd.

This being the state of the disease, it is difficult to say how many, and how different opinions physicians, of no inconsiderable note, gave of the disease; and not only those who were consulted by letters, but those who were present likewise; some saying that it was nothing else but an hypochondriac disorder, others I know not what dryness of the humours; some, again, a drying up of some of the branches of the nerves, join'd with too great a mobility of the humours; others, a spasmodic rheumatism, or a convulsion, from saline particles falling upon the muscles of the thorax and limbs, and there stimulating the nerves; while some, in short, affirm'd it to be an irritation from the virulent particles of the lues venerea, which stagnated in the mediastinum.

Valsalva was the only one amongst them all, who accounted for the greater part of the symptoms with which the patient was troubled, from a cause that was shut up within the cranium; and that, not only from considering the almost continual pains of the head and convulsions, which belong'd to so many and so different parts, but also from what he had sometimes seen in bodies after disorders that were partly similar to these. Wherefore, as others propos'd such kinds of remedies as were suitable to their several opinions of the disease; so he disapprov'd of those things which either encreas'd the quantity

tity or turgescency of the blood, or caus'd a considerable quantity of it to flow to the head, in proportion as he recommended such remedies as would have the opposite effects to these; especially as he saw, that if a turgescency was brought on in any other part of the body, the head was then reliev'd; and that by drawing blood from the vessels which are about the lower intestine, the patient had been a little better for some days. But although he, in general, knew the seat of the cause which brought on the disease, and what things conspir'd to lengthen out his life a little longer, and lessen his inconveniences; yet the particular seat of the cause, and the nature of it, which was insuperable by remedies, it was not possible for him to conjecture.

For when the body was dissected, all the other parts, not only in the thorax and belly, but in the head also, being found, in the falciform process of the dura mater were found five bones of different forms and magnitudes; but almost all of them horrid, as it were, with sharp spines. The largest of these, being fifteen lines in length, seven broad in the middle, and one and a half thick, according to the measure of Bologna, was strongly connected to the beginning, and the nearest part of that process, whose form it also resembl'd. This bone was intercepted for some tract by two bones, which were join'd to each other closely in the remainder of their extent. Thus join'd, they were equal in breadth to ten lines; but the broadest was five lines long, and the narrowest nine, which was two lines thick; yet on its lower side, or where it look'd towards the corpus callosum, it was very thin. To the extremity of this last the two other bones were connected, and closely intercepted the process; for although the longer bone, which was equal, for instance, to fourteen lines, was, like the former, plac'd on the right side, yet the shorter, which equall'd nine lines, was on the left side. Therefore, all these five bones occupied two-thirds and more of the whole length of the process, beginning from the anterior part, and going backwards. Besides these, there was a bone, which perhaps had been the last form'd, of the bigness of a lentil.

7. Valsalva judg'd, that from the time the patient had abus'd the mud of the baths, above mention'd, and studied to dispel from the joints the matter which had been accusom'd to cause a gout, some part of this matter was intercepted betwixt the fibres of the falciform process, and begun to bring on pains of the head, to which he had never before been subject: and that the same matter gradually concreting afterwards into these bones which have been describ'd, had excited those convulsions, after they had begun, with their sharp points, to prick both the meninges, which happen'd particularly in certain motions of the body; and from these convulsions, not only the other symptoms, but those fainting paroxysms also, arose: on account of which, chiefly, I have related the disease, and dissection of the patient, in this letter. Yet he readily confess'd, that it could not be sufficiently explain'd, why nothing of the same kind happen'd upon the motions of coughing or sneezing, by which the meninges seem to receive very vehement concussions. I do indeed remember to have said, when I took notice to you on a former occasion (*p*), of most of the examples of bones being found in the falciform

process, that great disorders were occasion'd by them, when they prick'd the meninges. But I do not remember that they were not brought on by the more considerable motions, though they were by the less considerable. Thus, for instance, in that observation which is related in the History of the Royal Academy of Sciences at Paris, under the year 1711, that young man who, from the same cause, was seiz'd with epileptic paroxysms, and those generally in the night, fell, nevertheless, into the same paroxysms in the daytime, if he walk'd. And if we ought not only to attend to the concussion, but also the greater quantity or impetus of the blood in the vessels of the meninges, from whence the meninges themselves are more urg'd to the little bones, as is evident from reasoning, and is confirm'd by the observations of Scheidius (*q*) and Hunauld (*r*); the first of whom observ'd some alleviation to a head-ach, or epilepsy, brought on by a cause of that kind, from blood-letting; and the other, that this was the only useful remedy; who is there, that would suppose the quantity or impetus of the blood to be more encreas'd from a slight motion of the arms, than from the violent motion of coughing or sneezing? But although what Valsalva could not understand is equally inexplicable to me at present, yet, what is sufficient for our purpose, it is plain, as there was nothing else besides those bones in the whole body, from whence the violent disorders which had preceded could be accounted for; it is plain, I say, in this case also, what we ought to accuse. For there was nothing found here in the heart or the brain, as there was in the bishop whom Lancisi (*s*) describes, as being subject to swoonings, and attack'd with convulsions, when he mov'd himself; nothing, I say, to which you could with more justice, ascribe these disorders, than to the bones, which were also found in the dura mater of the bishop.

8. But there are, you will say, examples extant of bones being found in the same membrane, from which, however, no inconveniences have been observ'd to arise. And I am so far from denying this, that I make no scruple to confirm it by my own observations. For besides that large bone, which I have describ'd to you before (*t*), I found another, in a man of whom I shall speak to you on a future occasion (*u*), of the size of a small grape, and of a surface slightly granulated, lying betwixt the dura and pia mater, which had hollow'd out to itself a corresponding cavity, in a distended furrow of the brain, where the upper part of the left hemisphere was distant about four inches from its anterior extremity, and about an inch and a half from the right hemisphere; the parietes of the cavity, and the surrounding substance, being in their natural state. And not to digress too far from the falciform process, in the year 1726, and the year 1744, when, according to custom, I dissected more than one brain in the college, I saw bones there in a man, and in like manner in a woman, which had the following situations and appearances. In the man, under the very vertex, on each side of the longitudinal sinus, in the very substance of the dura mater, was a separate bone, of no inconsiderable size; one of which terminated in a great number of

(*q*) Dissert. de duob. officul. in Apopl. qu. 6.

(*r*) Hist. de l'Acad. R. des Sc. A. 1734. Obsl. Anat. 2.

(*s*) De Subit. Mort. l. 1. c. 20. n. 3. 4.

(*t*) Epist. 3. n. 20.

(*u*) Epist. 52. n. 32.

oblong and sharp little teeth, as it were. And in the woman were three little bones, plac'd nearly under the vertex, the thickest of which sent forth the same kind of little teeth from two sides of it, but principally from one; the others were only like two scales, a smaller and a larger. The former of these was in the external side of the same sinus, which I mention'd a little before; and the two latter were bordering upon each other, nor very distant from the lower border of the falx; and adher'd in such a manner to the right surface of this process, that they could be easily pull'd away. But if you enquire now to what disease or inconvenience each of these persons had been subject, before their last disorder, I answer, that I also had enquir'd, and especially in regard to this woman, who being, to appearance, of a middle age, had died after a spitting of blood; but, as generally happens in beggars, I could find out nothing to note down as certain. Is it therefore to be taken for granted, that no inconvenience at all had been brought on by those little bones? No more, certainly, than where Caspar Hoffman (*) takes no notice what injuries had been brought on by "a cartilaginous bone, exactly round," which he had found cover'd, on both sides, with the dura mater, and "of the bigness of a six-dollar;" or rather, to omit the smaller, and mention the larger, than where Dionis (y) says, that he had found the same dura mater become almost bony in a noted artificer, and does not point out to what disorders he had been subject. Without doubt, he either could not get sufficient information what these had been; or if he had information, which I am rather inclin'd to believe, of this noted man, and not a beggar, he deferr'd it to a more convenient place and time: and if he has done this at any time, or in any place, that history seems to me to be very useful, either to confirm, in part, some of the uses of that membrane, about which there is great dispute in the present age, or entirely to reject them.

And this is to be observ'd besides, that although bones which prick the meninges, are extremely hurtful; as that which Peter Borelli (z) has mention'd as being found "in the dura mater, and being arm'd with many sharp points, from whence the patient had long suffer'd pains of the head," and a great number of other bones of the same kind (a); yet unless they are of such a form, and in such a situation, that they can prick the meninges; or of such a weight, and a bulk so encreas'd, that by pressing or drawing downwards some one of the sinusses in particular, and that of the falciform process, which I have mention'd, so as to streighten it; they will scarcely produce any marks of their existence, as I have said elsewhere (b). And as you see how much those that were found by Valsalva differ'd from these, both in shape and situation, to say nothing of number and magnitude; so I would not have you object other observations to his, which are not to be compar'd with it.

9. And I wish that those bones, at least, which are so hurtful, would afford no less certain and peculiar, than considerable, marks of their existence.

(x) Apolog. pro Gal. l. 2. S. 4. c. 287.

(y) Descript. d'une oreille du Cœur, extr. dilat.

(z) Hist. & obs. Med. Phys. Cent. 4. obs. 99.

(a) ut Sepulchr. l. 1. S. 1. Obs. 113.

(b) Epist. 3. n. 20. & 21.

But these marks are common to so many other causes, that Scheidius (*c*) has justly determin'd that there is scarcely room for any suspicion of those bones, even when some long and obstinate disorders of the head give place to no remedies, and scarcely ever remit. And, indeed, if it were possible clearly to determine the cause, these little bones could not be remov'd, nor their farther production be prevented, as is shown by the same author (*d*). And he has said, in that place, with great elegance and propriety, which formerly came into my mind, when a senior physician, who often, for the sake of diffension, involv'd himself in difficulties, propos'd that a bone, which had been form'd, as he said, at the beginning of the aorta, in a noble patient, should be dissolv'd by remedies; for it was very possible that the substance which from fluid had become hard, might be brought back again from its state of hardness to fluidity: Scheidius, I say, has said, "that it is not so much "from the parsimony, as from the bounty of nature, that we are depriv'd" of remedies of this kind; for wherever we should dissolve the bones which are generated by the force of disease, there also the other bones, which are the construction of nature itself, would be, in like manner, destroy'd.

However, whether there are remedies, not by which the bones that are already form'd may be dissolv'd, but whereby those that are about to be form'd, or, at least, about to be increas'd in the arteries, may be prevented; you will understand from those things, which will be consider'd in another letter (*e*), upon the production of bones in the arteries, proceeding from a kind of suppuration, and join'd with ulcerations thereof; for those remedies that could prevent this cause, could also prevent the effect. But however the matter may take place in some ossifications of the arteries, whether the same judgment is to be form'd of those which we are speaking of at present, you will, in the mean while, doubt, in conjunction with me. For neither have I yet seen, that marks of suppuration or ulceration have been join'd with bones, which I have found in the meninges: nor have I seen that they were any kind of bony scales, or, if you please, ossiform scales only; but really genuine and true bones. For to pass over other marks of true bone, if you will read over again the description of that great bone (*f*), which I found in the falciform process, you will certainly see how it terminated on each side in a simple stratum of parallel bony fibres: and to this even those long and sharp little teeth, as it were, seem to relate, into which some of the lesser bones, that I have describ'd above (*g*), were extenuated. And this mark, which consists "in an order, as it were, of fibrillæ running out in a "strait direction, as we observe in bones," I see is not only propos'd and confirm'd by the already commended Scheidius (*b*), but also by other very skilful men, in order to distinguish true bones from hard concretions of any other kind. Thus Abraham Vater (*i*) always distinguish'd a true bone from a calculus, "by its whitish stræ, and its striated texture." So by John Saltzman, even in the judgment of the celebrated Crellius (*k*), "a regular

(*c*) qu. 6. cit. supra, ad n. 7.

(*d*) qu. 7. (*e*) Epist. 27. n. 30.

(*f*) Epist. 3. n. 20.

(*g*) n. 8.

(*b*) qu. 2.

(*i*) Progr. ad Obs. rariss. calcul. & Osteogen. thes. 27.

(*k*) Obs. de art. Coron. Cord. instar. oss. indur. n. 9.

"disposition of fibres, according to a certain direction, is given as the mark "and character of a true bone." As far, therefore, as I have been able to observe to this time, I am not at liberty to be of the same opinion with those very learned men, who acknowledge true bones in the arteries, rather than in the meninges. And in these membranes I have seen, as I think, if not a bone, at least the beginning of a bone, not only within the cranium, but also within the tube of the vertebræ, and there in the tunica arachnoides itself; and I do not know whether this has happen'd to others before. For in that old man in whom I found some part of the pleura, or of the membrane of the adhering lungs, bony, as I have written to you in another letter (1), when I demonstrated to the students in anatomy, the integuments of the medulla spinalis, which was laid bare, posteriorly, in its situation, having drawn aside the dura mater, and blown in air betwixt the tunica arachnoides, and the pia mater; I observ'd in the former of these coats, which was universally elevated, a particle of the shape of a seed of a gourd, and about the size of a small one, plac'd transversely, and whitish, already almost opaque, and on its internal surface roughish, and evidently unequal. This particle being nearer to the left side, answer'd to the eleventh vertebra of the thorax; nor did any thing of that kind appear in the other meninges. But I will dismiss this subject, and to three observations of Valsalva upon swoonings, I will subjoin some of my own.

10. A poor woman, seemingly of fifty years of age, or more than that, small in stature, and rather of a lean habit of body, having been seiz'd, a year before, with so considerable a syncope as to be taken for dead, and after that time, with several others, was at length found dead in her bed.

The body was given to be dissected in our theatre at the time that I began to give the anatomical lectures, in the year 1726. In the belly there was nothing worthy of remark, if you except the spleen being too small, and, wheresoever you cut into it, almost dissolv'd into a fluor; and one of the tubes of the uterus, which was so condens'd at its extremity with the ovarium, as to have its orifice, which was there, entirely shut up.

In the thorax, the left lobe of the lungs was, in several places, connected to the side. In the vena cava, the right auricle, and, in some measure, in the neighbouring ventricle, were thick polypous concretions, of a white and flesh-like colour, which very much resisted distraction, and had some coagula of black blood adhering to them. In the left cavities of the heart was a small quantity of blood. Both the valvulæ mitrales near the edges were become pretty thick and hard, and protuberated in that part into a series, as it were, of largish globules, which, when cut into, show'd a substance similar to that of a tendon. The neighbouring femilunar valves were also thicker than usual, but in a less degree: and one of these had the corpusculum Arantii encreas'd, and adhering only in a small part of it. The great artery, immediately as it went out from the heart, was dilated: and near the orifices of the branches that go to the superior parts, on its internal surface, it was unequal and yellowish, and so lax, that the yellowish membranous laminæ, if you attempted it with your finger, could be pull'd away with ease. The pulmo-

(1) XXI. n. 22.

nary artery also seem'd to be larger than its natural size. But to return to the heart; the parietes thereof, wherever you cut into them, show'd sections, that from a cineritious colour, degenerated into a brown and livid appearance; and I dissected the heart on the thirteenth day after death; which I tell you for this reason, that if you rather choose it, you may, in some measure, attribute that, or any thing which was remark'd in the aorta, to this delay, notwithstanding it was in the winter-season. And suppose me to say the same thing of some of the appearances which I saw in the dissection of the brain; and so much the more, as being taken up with other bodies, I deferr'd the dissection of this part for the space of two whole days besides.

When the head was cut off from the neck, no inconsiderable quantity of water flow'd out. Yet under the pia mater, in the lateral ventricles of the brain, and in the third ventricle, a great quantity of water stagnated, which was not at all turbid. The plexus choroides were palish, except that in the middle they were black, from stagnating blood. And the same plexusses, where they are inflected, and about to enter the upper part of the ventricles, swell'd forth into large vesicles, and especially on the left side, that were full of water. The septum lucidum, although I dissected, according to my usual method, the brain in its situation, was either ruptur'd before, or was easily ruptur'd in the dissection; for it was so thin and lax as scarcely to appear. And the roots of the fornix, and the substance of the fornix itself, were very soft, as the cortex of the cerebellum was also; which, like the cortex cerebri, was of a dirty pale colour, inclining to yellow. But the medullary substances of both, and particularly of the cerebrum, were of their natural firmness; but in this last, the sanguiferous vessels were here and there conspicuous: which I had also remark'd, in the pia mater, to be in some places turgid with blood. The carotid arteries, at the basis of the cerebrum, were pretty hard, and the basilar artery in like manner. And, indeed, the latter of these, being about the middle of its length of a white colour inclining to yellow, shew'd an unequal surface when open'd, so as to convince us, that the disease which we had seen in the aorta at the beginning of the superior branches, was propagated through some of them quite into the cranium. Finally, the pituitary gland had not only sub sided immoderately, but contain'd scarcely any thing of its own substance.

11. As, by reason of the dilatation of the aorta and the pulmonary artery, the heart wanted greater strength, in order to protrude the blood so far as it us'd to do by the help of them; and as, by reason of the canals which convey'd the blood to the brain being vitiated, the strength of the heart, also, was less than usual; from hence, I suppose, the heart was under a necessity of becoming quiet very often, till by reason of the great quantity of water within the cranium being increas'd from the disease of the pituitary gland, it was depriv'd of all its strength, and was reduc'd to a perpetual quiet, by an affection compounded of a syncope and an apoplexy. However, other examples of swoonings from dilatations of the great artery, I shall, perhaps, produce in other letters, besides those which I have already given you (*m*), as copied from Valsalva. But let us now go on to other things.

12. A man, of a middle age, had already lain six months in this hospital, on account of a very bad ulcer in one of his legs, when he was carried off by an unexpected syncope, in the beginning of May, in the year 1723. The thorax and pericardium being open'd, in the former was a considerable quantity of water, with some concretions resembling jelly : and in the latter I observ'd the left ventricle of the heart to be thicker and harder than it naturally is. And as I suppos'd this to have happen'd from pretty large and firm polypous concretions, I cut into the heart, but found only some slender and mucous concretions in both of the ventricles equally : and I found that this thickness and hardness arose from no other cause than from the corneæ columnæ being grown thicker, and protuberating internally into the cavity of the left ventricle ; which in other respects, however, had their natural appearance both internally and externally.

13. I am not a little in doubt, whether I have sufficiently understood the cause of that syncope. For in whatsoever method I attempt to explain the case, this objection always occurs, that other syncopes, or, at least, faintings, had not preceded. Without doubt, the increase of thickness in those columns could not happen in a point of time. Why then, if from the completion of this thickness a syncope was brought on, had not a lypothymia been the consequence of its being almost perfected ? Or are we to call in here, also, the aid of some other cause ; as, for instance, a convulsion in consequence of deprav'd ichor being taken up from the ulcer of the leg, and carried suddenly, at that time, to the origins of the nerves, as it had been some time before to the thorax ; which those gelatinous concretions seem to shew ? By this convulsion, without doubt, just as in that man of Pistoia, spoken of by Lancisi (n), the apex of the heart being violently and obstinately contracted towards the basis, a sudden syncope might be brought on ; and the heart being at the same time conglobated into itself, its hardness and thickness might be increas'd. And that the heart may be "convuls'd," was not only formerly said by Hippocrates, in more places than one (o) ; but as it has been confirm'd by the more modern authors that it is a muscle, so it could not be denied, that it was, certainly, subject to the same disorders to which other muscles are, and consequently to convulsion also ; so that the nerves being irritated by the most acrid ichor, the fibres of the heart may remain in an obstinate convulsion.

On the other hand, it sometimes happens, that a resolution and laxity of the heart seem to be the properties that are to be accus'd in disorders of that kind. Thus, in a history of the celebrated Gretzius (p), which has been taken notice of in another place, in like manner as in a woman who died "of continual lypothymia," no blood was found in the cavities of the heart, but the heart "was universally distended with flatus" to such a degree, that "you would have call'd it a tympanites of the heart ;" whether the air had discharg'd itself while she was living, or whether it rather was extruded in the greater part of it from the blood after death ; you will not easily understand how it could possibly distend the parietes to that great degree, especially of

(n) De Subit. Mort. Obs. Phys. Anat. 4.

(p) Disp. de Hydr. Pericard. in Procem.

(o) De Morbo Sacro n. 18. De Nat. Mul.

n. 46. De Morb. Mul. l. 1. n. 72.

the left ventricle, unless you will suppose that they had been very lax, and, finally, entirely paralytic. But as to the paralysis of the heart, I shall have an opportunity of writing of that also in another place (g).

14. As I have in part propos'd the remaining observations of mine relative to the disorders of which I treat here, in other letters (r) already sent to you, and in part am to propose them hereafter; I shall now subjoin two very short histories, which, when I liv'd at Bologna, I had communicated to me from men of learning and undoubted credit. They came into my mind as I turn'd over this tenth section of the Sepulchretum, and read, and compar'd one with another, many observations which relate both to the disorders of the membranes surrounding the heart, and particularly to those of the heart itself. These membranes are, as you know, the mediastinum, the pericardium, and the proper membrane of the heart. In regard to the inflammation of the mediastinum, if you read what is produc'd under number eighteen, you will suppose that there are three observations, whereas there are only two; for that which is given under article the second, is the same that is immediately propos'd again under the third article; and this you will be evidently convinc'd of, not so much by attending to the words, which are, by I know not what chance or licence, different in the different observations; as by comparing the first of them with that which is pointed out to be read under the title *De Dyspnœa*, that is, in the first section of this second book, observation the hundred and twenty-fifth, article the first; for you will then observe, that the first is taken from the same place, and from the same author, from whence that is said to be taken which follows it. Nor, indeed, is there any reason to doubt, but that article the fourth, which is immediately subjoin'd, and relates to pus being shut up within the pericardium, after an inflammation of that cavity, is the same which had been given, somewhat more at large, a little before, under article the second, observation the thirteenth. And if you read it over where the whole of it had been describ'd, that is to say, not in the third, but the fourth section, *observation the fourth*; you will find that it relates to the third membrane also, that is, the proper membrane of the heart, and even to the heart itself, being in part corroded and wither'd. But if you, at length, enquire, whether that "kind of coat, which lay upon the heart itself, and was full of a certain humidity of a fœtid odour," relates to this membrane, or to the pericardium, or rather to some other preternatural membrane that had grown upon one or the other of the two; which coat, according to the testimony of Galen, as is said in the twelfth observation, "was found in the dissection of the body, when the cause of the syncope was enquir'd after;" I fear how far you may be able to learn that from the books of Galen: and I suspect, that, if the commentaries from whence these things are taken are indeed those of Philotheus, or Theophilus, or Stephanus, for they are ascrib'd to one of these authors in one place, and to another in another; I say, I suspect that the book of Galen in which these things might have been read, has been lost: but, otherwise, that what Galen had written (s) of an ape being emaciated more and more, and of a tumour in

(g) *Epiſt.* 26. n. 38.(r) *XVIII.* n. 2. & *XXIV.* n. 13, & 34.(s) *De Loc. aff.* l. 5. c. 2.

the coat which surrounded his heart, containing a humour like that of hydatids, have been by some kind of neglect or other transferr'd, perhaps, to a syncope and a fœtid humour. But be these things as they may, they have brought to my mind the following observation.

15. A monk, having been afflicted with many symptoms of ill health, and particularly with swoonings, clos'd the period of his life. The pericardium was found full of water, and in part connected with the heart: and from the basis of the heart hung a large hydatid.

16. That a dropsy of the pericardium may be brought on by the humour that is effus'd from hydatids, I have already taken notice on a former occasion (*t*), when among the other causes of this disease I also recounted this. And, indeed, it is very natural to that disorder to have taken place in this monk from hydatids, like that which even then remain'd entire, being previously ruptur'd.

And that swoonings have been, sometimes, also join'd with a dropsy of the pericardium, the observations which I have sent to you formerly (*u*) shew. But with this you will particularly compare that which is copied from Val-salva in the former letter (*x*), and which exhibits a dropsy of the pericardium, and, at the same time, certain connections to the heart, with an impediment of its apex. A very considerable obstacle of another kind to the motion of the heart was found by Lanzonus (*y*), within the pericardium, when he dissected the body of a woman who died of a frequent syncope; I mean, three greenish calculi, one of which was so large as to equal the weight of two ounces.

But the other observation that I have promis'd you, relates to a much more violent disorder, inasmuch as it was a disorder of the heart itself; I mean, an ulcer. I shall not comprise this in more words than the former, that is, in just so many as I receiv'd it from the mouth of Albertini himself, who had attended upon the patient, night and day, under his preceptor Malpighi.

17. The commander of the city fortress was frequently seiz'd with a pain at the region of his heart, and a syncope that was the consequence of it. Being under the cautious and diligent care of Malpighi, he seem'd likely to have recover'd, when at length being seiz'd with an acute fever he died. In the heart were found both polypi and an ulcer.

18. Take care how you suppose this to be the same commander of the same citadel, whose disease and dissection Malpighi (*z*) himself has made mention of; and who, being subject to a very acute pain at the sternum and in one of his arms, had a heart twice as big as the natural size, with a large polypus in the right auricle. For that gentleman was of the Baldeschi family, and this, if I remember rightly, was of the Passionei, which was a very noble family; nor could Albertini have attended upon the former, as he died in the year 1667: nor, indeed, does disease agree with disease, nor dissection with dissection. However, I do not imagine you are in the number of those who, being followers of Harvey in every thing without reserve, wonder that there

(*t*) Epist. 16. n. 44.

(*u*) Epist. cad. n. 43. & XXIV. n. 34.

(*x*) Ibid. n. 2.

(*y*) Eph. N. C. Dec. 3. A. 7. Obf. 75.

(*z*) Op. Posth. ubi de Polypo cordis.

should have been any pain from an ulcer of the heart; because he (*a*) had thought that it was "insensible;" for this reason, that a young man in whom, from an extraordinary accident, the apex of the heart could be touch'd, did not perceive when it was touch'd; as if "an excrescence of fungous flesh," as he himself relates, had not "cover'd over" this apex. I confess, that where such a kind of flesh has been form'd; or where the heart is lax and flaccid; and where it has the membrane which is proper to it, with the nerves that lie under it, less tense than usual, either from its long maceration in a great quantity of water that is contain'd in the pericardium, or from any other cause whatever; I will not then be very hasty in denying that ulcers of the heart may exist without any considerable sense of pain. But before these things, or others of that kind come to pass, I shall wonder if the heart be eroded, or ulcerated, without pain. Therefore, when Olaus Borrichius, describing the heart of the centurion (*b*), relates, that the external flesh of it was deeply eroded, and transform'd into jagged pieces and putrescent villi, it is not so surprising to me that the centurion had at that time no pain; I mean, because "the membrane proper to the heart was consum'd" by an acrid humour with which the pericardium had been distended. But as to the "patient never having complain'd of a pain of the heart," that, indeed, cannot be otherwise than surprising; unless we perhaps suppose, that this membrane being relax'd by maceration, had been consum'd, or at least made very insensible, before the humor pericardii had become acrid and fit for erosion.

19. It seem'd incredible to the ancient authors, that the heart could bear so violent and so long-continu'd disorders, although Pliny (*c*) has exaggerated the opinion much more than Aristotle (*d*), by asserting, as I have mention'd in another place (*e*), "That the heart being hurt, is the immediate cause of death." For Aristotle, although he had said, "that the heart had been hitherto never seen to be so affected in any victim as the other viscera had been;" yet he did not deny that those parts, being sometimes vitiated, which are most closely connected to the heart, "the animals that died of a disorder or vitiated state of this kind, shew'd morbid affections in the heart, when dissected:" and these, I suppose, he did not believe were made so conspicuous in an instant of time. Nor indeed did Aretæus (*f*), nor Galen (*g*), teach that life was immediately taken away by every injury of the heart; as the latter has expressly said, that of those in whom the wound of the heart did not reach quite to the ventricle, "some might live, not only through the same day on which they were wounded, but also through the following night;" and the other, that if the aphthæ go down from the fauces into the penetralia of the thorax, they do not instantly, "but only on the same day, cause strangulation." Yet the same author has said, that the heart "neither bears ulcers nor sanious humours;" and Galen, that from inflammation, or erysipelas, "while it begins to be form'd, and before

(a) De Generat. Animal. Exercit. 52.

(b) In Bartholini Act. Med. Hafn. Vol. 1. Obs. 89.

(c) Nat. Hist. l. 11. c. 37.

(d) De Part. Animal. l. 3. c. 4.

(e) Epist. 21. n. 5.

(f) De Caus. Acut. Morb. l. 1. c. 9.

(g) De Loc. aff. l. 5. c. 2.

"a disorder of this kind can be increas'd, the animal is immediately taken "off:" for which reason, as he had before asserted (*b*), "it was impossible "that the heart should be affected with an abscess." And the same opinion was embrac'd by more modern physicians than these, who follow'd the opinion of their predecessors, and even that of the very ancient author of the book *De Morbis* (*i*), who had said, "that no disease arose in the heart;" none of them indeed through their own faults, but all through the fault of the times, till the dissection of bodies began to teach quite different things; not the bodies of beasts, but of men, as being those animals whom a various kind of intemperance, but especially cares, and violent passions of the mind long-continu'd, frequently make liable to diseases of the heart, and the adjoining vessels. The first observation, as far as I can now call to mind, or, at least, one of the first, was that of Benivenius (*k*), about the beginning of the sixteenth century, who, in a thief that had been publicly hang'd, found "an abscess in the left ventricle of the heart redundant "with pituita." This observation was succeeded, not many years after, by another of the physicians at Vienna, from whom Matthias Cornax having heard it, publish'd it long after in an explication added to his history (*l*); which observation is the first of this section in the Sepulchretum, and relates, "that more than half of the heart was sanious, and wasted away with putrefaction;" that is, as I understand it, in regard to the thickness of the parietes. After the interval of a very few years, Nicolaus Massa (*m*) added a third, the summary of which you have in the scholium to the observation made at Vienna, as far as the memory of Cornax could furnish him with it; for Massa, to take no notice of other things, saw, in the right ventricle, a remarkable imposthume, "internally; and the left auricle, which "was extremely small, universally ulcerated on its external surface, with a "manifest sanies;" but he saw an ulcer much larger "than the half of a hen's egg-shell," not in the heart, but "in the substance of the lungs, "on the left side." Which blunder of Cornax, although considerably encreas'd in the Sepulchretum, where the ulcer is said to be "of the bigness "of a hen's egg," I should willingly have pass'd by, in this place, if it had not been absolutely necessary for me to take notice of it, as you will see presently, in order to perform what I promis'd you in the former letter (*n*); I mean, to enquire, whether, with ulcers of the heart, both faintings and intermissions of the pulse are always join'd.

20. For as the observation of Benivenius, and not a few of the many which follow'd it afterwards, are altogether silent, or at least more so than I could wish, in regard to the symptoms of disorder which had preceded; so that the two next observations, that of the Vienna physicians and Massa, are the more to be regarded; the first of which informs us, that many and frequent swoonings had, for a year before, preceded the last and fatal syncope; and the second seems to shew clearly, that in a man who died, in other respects, of abscesses of the cerebrum and cerebellum, after a wound in the

(b) Ibid. l. 1. c. 5.

(i) l. 4. n. 13.

(k) De addit. morb. caus. c. 89.

(l) Gest. in utero fet. mort. c. 3.

(m) lib. Introduct. Anat. c. 28.

(n) n. 22.

head, no sign had preceded, which had any relation to the heart; you readily perceive that I am to consider, whether I ought to follow Cornax or not, who believes that there had not been any swoonings in this patient of Massa, for this reason, that the disorder of the heart was more recent. And I follow him the more readily, when I observe that there was pus, not only in the heart, but also in the lungs; both of which might, without doubt, have been easily translated from the head, just before the close of life, when the man lay hemiplegic, delirious, and like a dying person. For that sanies is not always carried by metastasis from the head, when wounded, to the liver, but sometimes to the other viscera in like manner, has been found by the very experienc'd physician and surgeon Mollinelli (o): and although it happen'd to him to observe, that these viscera "were always in the number of those that are contain'd in the belly;" yet I do not see, that this is at all repugnant to our supposing the viscera, which are contain'd in the thorax, to be sometimes capable of being thus affected likewise (*): nor do I see, that those things can be easily explain'd otherwise, whch Massa found in the lungs and the heart of this man, whom, before the wound, "he had known to be healthy, and never to have complain'd of "any pain, nor to have cough'd, after his being confin'd to bed with his "wound, &c."

To this I might perhaps add that sanies which the celebrated Daniel Hoffman (p) saw distil from ulcers that had been open'd in the arm and the thigh, of the same colour with that which came from a wound of the head and cerebrum; so that he did not doubt but it had been carried from the head into all the parts of the body. However, it is sufficient for me, that the great archiater Senac (q) also, whom I frequently read, as I revise these letters, has chosen rather to explain the observation of Massa in the same manner that I have explain'd it. Setting this aside, therefore, let us attend to other things. In this tenth section of the Sepulchretum, therefore, there are, in all, five observations, in which the ulceration of the heart is read of; that is to say, the first, as I have already said, the second, the eighth, the tenth, and that which is the second in the additamenta. And in the ninth section are no more than two, which are the eleventh and forty-second. Read them all over. In the two last you will, indeed, find an intermission of the pulse, but no deliquia. In the former, on the other hand, you will generally find these deliquia, but not an intermission of the pulse. There is then, not one of all these observations which has both these circumstances join'd together. For although the eighth of the tenth section has this title prefix'd to it, "A Lypothymia in consequence of an ulceration of the heart;" yet in fact, if it be very attentively examin'd, not only then, or in the ninth section, under number the forty-second, for it is the same, but particularly in the fifth section, under number twenty-one, where it is describ'd more at large, from the author Riverius; we are so far from finding any swooning which preceded death, that we shall even perceive, that the intermission of the pulse "had

(o) De Bonon. Sc. Acad. Comment. Tom. 2.
P. 1. ubi Medica.

(*) Quin de his rebus Vid. quæ fufius scribuntur Epist. 51. n. 21. & seqq.

(p) A& N. C. Tom. 5. Obs. 54.

(q) Traité du Cocuz, l. 4. ch. 7. n. 2.

"ceas'd" many days before death. Thus also, if you perhaps doubt, whether in the eleventh observation of the ninth section something may not be wanting, that relates to deliquia; turn to the same where it is given more in full under the twenty-seventh number of the first section, and I answer for it, it will not only happen that you will find not a single word of these symptoms, but you will probably think with Riverius, from whose accurate description this, as well as the former, was taken, that the dilatation of the right auricle of the heart, join'd together with an exulceration of the same, "had been the cause of so great an inequality and intermission of the pulse." And because I have observ'd above (r), that a certain observation of the tenth section, which is given under number the thirteenth, article the second, and again under number the eighteenth, article the fourth, if it be examin'd into in another place (s), where the whole of it may be read, shews the heart to have been in part "corroded and wither'd;" lest you should, perhaps, imagine, that there, at least, besides swoonings, an intermitting pulse is also mention'd, you may take it for granted, that even there you will not find any thing of this kind mention'd.

21. But are no other observations of the heart being ulcerated, you will say, besides those, produc'd or referr'd to in the Sepulchretum? In these two sections, that is to say, the ninth and tenth, indeed, others are not produc'd besides; unless you should, perhaps, suppose that the twenty-third of the ninth relates to the present subject of dispute, in which it is said that the membrane of the heart "was eroded and excoriated:" which observation I have designedly pass'd over, not only because the heart itself was unhurt, but particularly because no disorders which were join'd with it, are expressly mention'd; or if any one does seem to be mark'd out, it relates to the frequency, and not to the intermission, of the pulse.

But in certain scholia of the tenth section, some observations are indeed referr'd to, as you will see under number the second, both in that section, and in the additamenta to that section. However, the first, which, that you may compare them with his book, are those of Tulpus, have deliquia, but not intermissions of the pulse: the others, which refer to Cabrolus as their author, have not the former symptoms, but only the following assertion: "Lest any one should think, that death had been brought on them from these causes, both of them ended their life by the halter." And if any regard is to be paid to that wonderful observation of Bernardin Telesius, which is pointed out before these; although in that mention is made, not of an erosion, but of a hectic dryness of the heart, which was wasted, and, "only the coat of it" excepted, entirely destroy'd; that is, as I understand it, much in the same manner as Peyerus (t) found it in a certain phthisical patient, "so extenuated, that the left ventricle of it was scarcely equal in thickness to a common piece of leather, and the right was equal in the thickness of its parietes only to a simple coat;" you will certainly read nothing else in Telesius, but that this man had been "wasted away by a long-continu'd disease:" and you will look after this history (which is incredible, unless you explain

(r) N. 74.

(s) Sect. 4. Obs. 4. l. 2.

(t) Method. Hist. Anat. c. 6. in schol.

it in the manner I have mention'd) in his fifth book *Rerum Naturalium* chapter the twenty-fourth, not the twenty-eighth, that is referr'd to by Meckrenius himself, as well as in the Sepulchretum: and if it seem to you also, as it did to Meckrenius, that instead of the "coat of the heart" the pericardium is to be understood; you will understand that the heart itself, as frequently happens in heetical bodies, was closely connected to the pericardium: and although the other observation (*u*) seems still less credible, inasmuch as it relates to a healthy man who died suddenly; I mean, that "of the pericardium which contain'd the membrane of the heart fill'd with black blood, instead of the parenchymatous substance, which was entirely consum'd;" yet whatever truth there was in it cannot, in my opinion, be otherwise explain'd than in the method I before pointed out.

But besides those two sections, the ninth and tenth, in which we have hitherto enquir'd, I do not doubt but there are others which produce observations of the ulcerated heart, and indeed I in part know. Among which, however, take care how you number what is produc'd in the first book, section the second, under number the ninth, For Blancardus has deceiv'd Bonetus, who took him for the author of the observation in the scholium. For it is the same in effect, though not in words, as the second of the two, which above (*x*) is by me and by Bonetus justly and deservedly attributed to Riverius; from whom also Blancardus (*y*) had taken the first in a surreptitious manner, without mentioning it. But he has, besides, acted in the same manner with that which I have consider'd after those of Riverius; so as to make me very much suspect that he has impos'd upon Bonetus, and most other writers, and perhaps upon me also, in more than one place. Wherefore, dismissing this *homo versutiloquus*, or crafty-talking man, if I may be allow'd to use the word of an ancient poet (*z*), let us look out for authors who are more to be depended upon.

22. There is then, in the second book of the Sepulchretum, section the first, observation the eighty-sixth, which is taken notice of above (*a*), and was made by Olaus Borrichius, in a man who had the external flesh of the heart "deeply corroded, and transform'd into jagged pieces of flesh and putrescent villi." And I see that Peyerus (*b*) had observ'd something of the same kind, and Grætzius (*c*), who represented what he had seen in a figure by no means inelegant. But the latter of these, shewing briefly what symptoms had preceded, says, "that the patient had been long troubl'd with symptoms that seem'd to argue a dropy of the thorax." Peyerus has said no more than that the young man had been "consumptive, and dropsical." And Borrichius, although he mentions many things distinctly, and in particular, mentions not a word of swoonings, or of intermitting pulses. Nor is any mention of this kind made by Bonetus, when in the hundred-and-thirty-fourth observation, which seems to relate to the present subject, by reason of the right auricle of the heart "being fill'd with pus that flow'd out of the ven-

(*u*) Eph. N. C. Dec. 1. A. 6. Obs. 25. & in Sepulchr. l. 2. S. 11. Obs. 21.

(*x*) N. 20.

(*y*) Anat. Pract. Obs. 40.

(*z*) Apud Cicer. de Orat. l. 3.

(*a*) N. 18.

(*b*) In Schol. supra cit. ad n. 21.

(*c*) Disput. de Hydr. Pericard. § 3.

trices," he enumerates other things. I less wonder at that in the sixth section, observation the fifteenth, and section the seventh, observation the hundred-and-ninth, articles one and two. For Rota, Fernelius, and Trincavellius, have mention'd old ulcers of the heart; and the latter even says, that the "greater part of it was corroded;" which you will understand in the same manner as has been explain'd above (*d*), in the history taken at Vienna: yet as they only mention'd, not describ'd, the cases, one of them has signified, that the patient had for a long time labour'd under an empyema; another, that a consumption had been brought on by degrees; and the third, that the patient had suffer'd a long illness; and no more: although it is highly probable, that if the pulse had intermitted, or there had been accusom'd to be any swooning, that some one or other of them would have just signified it by a word at least.

And this I believe still more readily of our Marchetti, not "Dominic," but Peter the Chevalier, a relation of the other; for Dominic, although I see that his *Opera Chirurgica* are commended by a great writer; and indeed he was not only a very eminent physician, but as eminent a surgeon; yet has in fact publish'd nothing but his Anatomia. Wherefore the *Observationes Medico-chirurgicae* are the works of Peter; one of which is that forty-sixth observation, wherein you have the relation of an ulcer penetrating quite to the left cavity of the heart, and is immediately subjoin'd to the foremention'd observations of Fernelius and Trincavellius, article the third; but is given in quite a different manner from what it is by the author. Who having, besides a wasting of flesh, also enumerated "fever and loss of strength," it does not seem that if there had been any deliquia, or intermission of the pulse, he would have neglected to mention them, in order to give a reason why the cure of that fistulous ulcer which follow'd the wound of the sternum, could be attempted "with no hope of recovery."

Nor do I doubt but Hollerius also, if the archdeacon who had "an abscess in the substance of the heart," and the woman who had "many," had been troubl'd with these symptoms, would have mention'd both of them in the scholia to his chapter *De Syncope*, as he had mention'd in the last chapter (*e*) *De cordis Palpitatione*, what symptoms they had been afflicted with: and Bonetus has, in like manner, given us, under article the second of the eighth observation, section the eighth, which is on the same subject of palpitation, what relates to this very archdeacon; although I do not know why he has commended Forestus, as being the author of it, rather than Hollerius, from whom Forestus has confessedly copied this and many others that follow. But as to what is said under the first article of the same observation, of the ulcer of the heart in a woman, in such a manner as only to inform us, that being sent to the hot baths on account of a scabies, she came back from thence dropical; this is no more useful to us than what we likewise read under the eighth observation of the twelfth section, book the fourth, of the heart being eroded in a certain man, from a long-continu'd use of acidulated vitriolic waters. However, on the contrary, those are very useful which are to be met with in the same section, among the posthumous observations of

(*d*) N. 19.(*e*) 29. libri 2. de Morb. intern.

Jo. Bapt. Fantonus, the sixteenth and the twenty-eighth. For they are no imperfect, but both of them expressly inform us with what symptoms the patient had been afflicted, and particularly the first. Although then the heart of one was "externally purulent," that is, as the celebrated son of Fantonus afterwards publish'd, "corrupted;" and the heart of the other had "an abscess, which was already ruptur'd;" yet in neither of them any deliquium is said to have been, or any intermission of the pulse.

23. And these are the observations of ulcers, or open abscesses in the heart, on which it has hitherto happen'd that I have lit in turning over the Sepulchretum; or rather, which I remember to have read in this or other books; for I do not suppose, either that I have seen all the observations which ever were publish'd, or that I remember all that I have seen. And indeed, now I read these things over again, a passage of Lancisi comes into my mind (*f*), in which he says, that he had two or three times "found the surface of the heart corroded and ulcerated;" but "that the signs of this disorder were nearly common with the symptoms that accompany the aneurisms of the præcordia." Which is not at all to be wonder'd at, because he, "for the most part," found it complicated with the aneurisms: and that among the signs of those aneurisms, the two after which our enquiry is at present, are not necessarily to be consider'd, you readily understand, from a number of other histories of aneurisms of the præcordia, which I have sent to you already.

It might seem to those who read over the thirty-fifth chapter of Meckrenius (*g*), that even many other observations of ulcers of the heart are extant, and perhaps are really extant. Nevertheless, out of those that he produces or points out, you will find, if you diligently compare them, that some are the same with those that I have already consider'd, and the greater part of the others you will not find in the passages of those writers to whom he himself refers; and you will find that some are related by their original authors in quite a different manner from that in which he has related them. For when he relates his own observation, the latter part of which it is not easy to understand, he says, "An example similar to this," that is, of an ulcer of the heart, join'd with frequent swoonings, "Realdus Columbus writes, in his fifteenth book, *De re Anatomica*, that he had observ'd in a disciple of his, whom he had dissected at Rome." But Columbus, though it is true he does say that this disciple "had fallen now and then into a syncope," does not, however, say that he had an ulcer in his heart, but "that the pericardium was wanting." But to what disorders they had been subject while living, in whose hearts, after death, he saw "ulcers or an abscess," he does not tell us.

One author, however, yet remains, whom I had not in my hands when I wrote these things to you before; I mean the illustrious Senac. He, in that chapter (*b*) which he has entitled, "Inflammations, abscesses, and ulcers of the heart," has taken notice of so many observations, in which the heart was diseas'd, that if you should compare them, separately, with those that I have

(*f*) De Mot. Cord. Propos. 23, in Schol.

(*b*) Traité du Cœur l. 4. ch. 7.

(*g*) Obs. Med. Chirurg.

pointed out above, which I have not time to do at present, it could not happen but that you must find others which have been remark'd by this very learned man, besides these; at least some which were made at Paris; and particularly that taken from a woman, whom I heartily wish he had had the opportunity of seeing when she was dissected after death also, as he had had the opportunity of seeing her when she was living, and labouring under her disease. I would, therefore, have you, in as many as you find that have not been consider'd by me, attend to this at least in particular, whether both these signs, that are at present in question, are remark'd. For although Senac himself (*i*) expressly denies, that an inequality of the pulse is the necessary consequence of ulcers of the heart; yet, as he mentions this (*k*), and frequent deliquia, amongst the signs which "generally" attend those ulcers; you must see whether he is to be understood to speak of both the signs together, or rather, as I suppose, of one or the other only: for there is nothing from which you can better determine this question, than from those observations which still remain to be particularly considered by you, in his work.

24. But if you, in the mean time, enquire, what it has happened to Valsalva, Albertini, or me, to observe, you may read over again my sixteenth letter to you, at number seventeen, and forty-three; and the twenty-fourth, at number eighteen. You will find nothing of intermission of the pulse, nothing of swoonings, if you except some slight faintings, observed by Albertini. But these, you will say, were slight erosions, and only superficial. I confess they were so; but they were true erosions, and were in that part where it is hinted above (*l*), that the greatest trouble to the heart could be excited. And I said that they were true erosions, lest you should, perhaps, put them amongst the number of those, in which the external surface of the heart seems to be eroded, but is not really so: an example of which false erosion is given, for instance, in the twenty-first letter (*m*), where it is also shown from what cause it may happen, although somewhat briefly, and by what method it may be distinguish'd. That is to say, from the humor pericardii, which is in a preternatural state, a kind of concretions sometimes adheres to the heart; which, by their inequality and colour, resemble an erosion. It is easy for those who are not uninform'd of these concretions, to avoid fallacy, by taking them off; and by discovering the subjected membrane of the heart to be found. In those observations, therefore, of Borrichius, Peyerus, and Grætzius, which I have pointed out above (*n*), do not be too forward to suspect the same thing, when, enquiring after that membrane, they found it to be "consumed, in some places actually corroded," and the heart "deprived" of it. But to Valsalva and Albertini concretions of this kind were not unknown; and these concretions resemble other things, at other times; and amongst these fat, villi and hairs, as I have written in the preceding letter (*o*). For which reason I have withheld my assent, when I happened at any time to hear, that in a certain person, who had been troubled with pains and convulsions of the heart, besides the pericardium

(i) Ibid. n. 1. in fin.

(k) n. 3. (l) n. 19.

(m) n. 2.

(o) n. 4.

(n) n. 22.

being full of the most yellow water, all the fat of the heart was found to be jagged, here and there, as if it had been eaten by mice. For an appearance of this kind had offer'd itself to me before, in an old soldier, of whom I shall write to you hereafter (*p*); nor did I suffer it to impose upon me: nor did the celebrated Schreiberus suffer himself to be impos'd upon, when, in an observation which I have already related (*q*), after having expressly admonish'd, "that the large, long, and broad villi, which "were almost like tender and fungous flesh," and which every where adhere to the heart, "were form'd from the serum of the blood stagnating within "the pericardium;" he added figures of the villous hearts, accurately express'd; which if any one look upon that is ignorant of the circumstances, he will be immediately deceiv'd, nor in the least doubt, but they represent hearts, the fat, and the remaining surface of which were, in several places, deeply eaten into by corrosions. But whether, in the third observation of the second section of the second book of the Sepulchretum, the external surface of the heart, which is describ'd as being "altogether like to a piece of downy "cloth, or the internal coat of the stomach of ruminating animals," appear'd to be "in a manner corroded," by reason of concretions resembling villi, which had been deposited from the serum wherewith the pericardium was extremely tumid; or whether it really was, and "without a doubt, "from the acrimony of the serum, with the external substance of the heart," as is said in the scholium, entirely corroded, I leave quite undetermin'd; as in the observation of Laubius also (*r*), whether the surface of the heart was really eroded; for although the pericardium contain'd "more than a pound "of black and coagulated blood," yet this might easily have distill'd from another part than the surface of the heart; and Laubius himself, like a person who hesitates, relates the appearance in the following manner: that blood "being wip'd away by a sponge, the substance of the heart offer'd itself to "the eyes, cover'd over, as it were, with lamellæ, and eroded." But if the substance of the heart, in both the observations, was really corroded and eaten away; for I pass'd by both of them above, in consequence of my doubts upon this head; I would have you attend to this, that amongst the symptoms which the patients suffer'd, not a word is to be met with in regard to intermission of the pulse or swooning. And as in so great a number of histories, frequently, neither of them is mention'd, never both, and sometimes only one or the other, you naturally see, without any induction, what is to be thought of the question propos'd.

25. And if this be the case in open abscesses and ulcers of the heart, do you suppose that it will be different in those that are conceal'd? What symptoms had preceded, when Columbus found "hard tumours in the left "ventricle of the heart, even to the bigness of an egg," as in the Cardinal Gambara, this author, according to his general custom, does not relate (*s*): nor does Hildanus give any hints, in regard to the inconveniencies which were felt about the chest in a young man (*u*) who "had a white tubercle in

(*p*) Epist. 43. n. 17.

(*q*) Epist. 16. n. 46.

(*r*) Eph. N. C. Cent. 9. Obs. 15.

(*s*) n. 19. in fin.

(*t*) De Re Anat. l. 15.

(*u*) Cent. 1. Obs. 51.

“ the apex of the heart, to the bigness of a filbert;” nor, to return to the Sepulchretum, has Rhodius (x) mention’d any thing else in a man who had “ a follicle in the right auricle of the heart,” than a dropfy; nor Bartholin, any thing besides a waisting of flesh in an ox (y), which had “ an abscess of “ the bigness of an apple,” that adher’d to the right ventricle of the heart, and contain’d a serum within two follicles: nor has Gantius (z) mention’d any thing but a “ difficulty of breathing with a fever,” in a certain man, who had “ many excrescences ” in the basis of the heart; and amongst these one, “ equal in bigness to a pigeon’s egg,” all stuff’d up with soft matter. And you know (a), that when I, to pass over others design’dly, found a tubercle, which had form’d itself in the heart of an old man, I was well inform’d, that no intermission of the pulse, no swoonings, no palpitations, nor any symptoms at all, had preceded, from whence that tubercle could have been suppos’d to exist. For which reason, it is to be less wonder’d at if they are at any time seiz’d with sudden deaths, who complain’d of no inconvenience preceding; since a part so necessary to life, the heart itself, may, sometimes, without any particular symptoms of inconvenience to attend it, labour under a disorder of such a kind, that by the increase of it, the parietes of the heart being perforated, the life, together with the blood, may be lost. On the subject of deaths of this kind, the next letter will turn. Farewel.

LETTER the TWENTY-SIXTH

Treats of sudden Death, from a Disorder of the sanguiferous Vessels, especially those that lie in the Thorax.

1. **A**LTHOUGH sudden deaths seem to be grown more frequent than usual in this age, yet that they have not been uncommon, now and then, at various times, in Italy, and in other countries, in preceding ages, I have demonstrat’d to you in a former letter (a). This will be confirm’d, to omit Pliny (b), who has writt’n that they were “ frequent;” and although he mention’d many himself, has even inform’d us, “ that Verrius had produc’d a greater number of instances;” this, I say, will be confirm’d by the more recent examples of the eleventh section of the Sepulchretum, which is entitl’d, *De Morte Repentina*; there, in particular, where you will either find Bartholin (c) asserting, that in the year 1652, “ in the beginning of the

(x) l. 3. S. 21. Obs. 3. § 18.

(y) l. 2. S. 7. Obs. 112.

(z) Ibid. S. 1. in Additum. Obs. 2.

(a) Epist. 21. n. 4.

(a) Epist. 2. n. 2. & seqq.

(b) Nat. Hist. l. 7. c. 53.

(c) Obs. 24.

* month of February, by reason of the uncertain temperature of the air, "many were suddenly taken off in the city of Copenhagen, by an unexpected death;" or where Panarolus (*d*) informs us, "that in the year 1651, a great number was taken off, by a sudden and instantaneous death, in a short space of time," at Rome. To these add Lancisi (*e*), who shows that the same thing had happen'd under Alexander the seventh; that is, a few years after, in the same place, and in Tuscany about the same time, as I suppose, but before, that is, about the beginning of the last age, both at Rome and at Venice, and in other cities also.

2. But whensoever, and wheresoever, deaths of this kind have happen'd, I do not doubt but the cause is to be enquir'd after by anatomists, either in the brain and nerves, or in the lungs and aspera arteria, or, finally, in the heart and sanguiferous vessels; and Lancisi has before sufficiently demonstrated the same thing, in the excellent books which he publish'd, *De Subitaneis Mortibus* (*f*). Since, therefore, that cause has been already enquir'd after by me, in the two first of those different seats, when I wrote to you the letters upon apoplexy and upon suffocation; it will remain at present to enquire after it in the third seat, that is, in the heart and the sanguiferous vessels, and particularly in those that are contain'd in the thorax. For I am not willing to do what I see is frequently done in this section of the Sepulchretum, I mean, to repeat what I have before said of apoplectic or suffocated persons; nor yet to speak of those who have died suddenly from a peculiar injury of any of the abdominal viscera, before I begin to treat of the diseases of the belly: although the proximate cause of this kind of death is not in that diseas'd viscus, but by means of the nerves, or the sanguiferous vessels, is generally in the brain and the heart. That is to say, in this viscus of the belly, either the nerves are so irritated as to convulse the muscular part of the heart; or the meninges of the brain, or the vessels are so eroded, that the blood being extravasated, a proper quantity thereof is suddenly deficient in the heart and the brain. But these things we shall consider in their proper places.

I will now tell you what causes of sudden death have offer'd themselves to Valsalva, and to me, in the heart and the neighbouring vessels. And under the term of sudden death, I here understand that which, whether there is any previous apprehension of it or not, snatches a person away suddenly, contrary to his own expectation, or the expectation of others, at that time. Examples of which kind of death, from the disorder either of the heart, or the vessels that lie near it, I have had occasion to give in letter the seventeenth (*g*), the eighteenth (*h*), the twenty-first (*i*), the twenty-fourth (*k*), and the twenty-fifth (*l*). But now take the greater part of those which remain: and first, these three from Valsalva, that relate to the vessels; for those that refer to the heart, we shall refer to the next letter.

3. A man, of fifty years of age, who had been us'd to spit blood at times, though in small quantity, and sometimes also to breathe short, having laid

(*d*) Obs. 9.

(*e*) De Subit. Mort. l. 2. c. 3. n. 7.

(*f*) l. 1. c. 5. n. 4. & c. 9. & seqq.

(*g*) n. 10. 17.

(*h*) n. 2. 8. 14. 23.

(*i*) n. 47.

(*k*) n. 13.

(*l*) n. 2. 10. 12.

hold of a hammer with both his hands, and stricken something or other with a great force, and for a long time together, fell down suddenly, and with one or two words call'd out for help. Soon after, having lost his speech, and breathing with great difficulty, and having his face very pale, he died within half an hour.

The left cavity of the thorax was found quite full of blood, the greater part of which had coagulated. This blood had burst forth from the great artery that was eroded at the part where, being about to descend to the vertebræ, it is inflected. For in that place, being dilated into an aneurism, it had hollow'd out the corresponding vertebræ; and where these were hollow'd out, there the artery seem'd to be consum'd.

4. How much they ought to avoid any exertion of their strength, in whom there is a dilatation of an artery, even the present case shows. For an exertion of strength is follow'd by an encreas'd impetus of the blood, by which the coats of the arteries being extended, or in part eroded, are broken through. And although this happens to many of them spontaneously, as it did to that young man of whom I am next to give you the history, yet to many also it does not happen: and it becomes every body to beware, lest they themselves accelerate that death which otherwise would have come more slowly.

5. A young man, of about twenty-seven years of age, had been afflicted, already, for a long time with a pulsating kind of tumour in the right part of the thorax, betwixt the third and the fourth rib; in which tumour, while he turn'd himself from one side to the other, he felt a fluctuating matter that was acted upon by that motion: in the mean while, he had been often seiz'd with a shortness of breath; which, however, in a short time after a vein was open'd, remitted. One day, as he was at his devotions, he fell down suddenly; his face was pale, he could scarcely speak; he soon died.

In the thorax was seen a large aneurism. For where the carotid arteries came off from the aorta, it began; and extending itself to the sternum, to which it then strongly adher'd, so that it could not be separated without laceration; it was also produc'd under the right clavicle to the third and fourth rib, the internal surface of which it had hollow'd out, and had render'd rough and unequal. Finally, it came within the pericardium, where, being ruptur'd, it had fill'd all the cavity of it with blood. There was no polypous concretion in the heart.

6. But the great artery is sometimes eroded, even without an aneurism, and pours out its blood, as the next very short history teaches.

7. A certain man was taken off by a sudden death, in the latter end of June, in the year 1689. Permission being obtain'd, with great difficulty, from the relations to dissect the body, the aorta was found to be ruptur'd where it was nearest to the heart; and the pericardium was from thence quite full of coagulated blood.

8. Do not be surpriz'd that I make little or no remarks to these observations. For where I wrote upon the subject of aneurisms, I interspers'd a sufficient number of remarks that are suitable to the present occasion; and these observations are, in general, pretty clear of themselves; and besides these, I have a considerable number, which are not very short neither, to subjoin.

And that they may correspond, as far as possible, to the observations of Val-salva, already propos'd, I will begin with aneurisms of the aorta.

9. A man who had been too much given to the exercise of tennis and the abuse of wine, was, in consequence of both these irregularities, seiz'd with a pain of the right arm, and soon after of the left, join'd with a fever. After these there appear'd a tumour on the upper part of the sternum, like a large boil: by which appearance some vulgar surgeons being deceiv'd, and either not having at all observ'd, or having neglected, the pulsation, applied such things as are generally us'd to bring these tumours to suppuration; and these applications were of the most violent kind. As the tumour still encreas'd, others applied emollient medicines, from which it seem'd to them to be diminish'd; that is, from the fibres being rubb'd with ointments and relax'd; whereas they had been before greatly irritated by the applications. But as this circumstance related rather to the common integuments, than to the tumour itself, or to the coats that were proper thereto, it not only soon recover'd its former magnitude, but even was, plainly, seen to encrease every day. Wherefore, when the patient came into the Hospital of Incurables, at Bologna, which was, I suppose, in the year 1704, it was equal in size to a quince; and what was much worse, it began to exsude blood in one place; so that the man himself was very near having broken through the skin (this being reduc'd to the utmost thinness in that part, and he being quite ignorant of the danger which was at hand) when he began to pull off the bandages, for the sake of showing his disorder. But this circumstance being observ'd, he was prevented going on, and order'd to keep himself still, and to think seriously and piously of his departure from this mortal life, which was very near at hand, and inevitable. And this really happen'd on the day following, from the vast profusion of blood that had been foretold, though not so soon expected by the patient. Nevertheless, he had the presence of mind, immediately as he felt the blood gushing forth, not only to commend himself to God, but to take up with his own hands a basin that lay at his bed-side; and, as if he had been receiving the blood of another person, put it beneath the gaping tumour, while the attendants immediately ran to him as fast as possible, in whose arms he soon after expired.

In examining the body before I dissected it, I saw that there was no longer any tumour, inasmuch as it had subsided after the blood, by which it had been rais'd up externally, had been discharg'd. The skin was there broken through, and the parts that lie beneath it with an aperture, which admitted two fingers at once. The membrana adiposa of the thorax discharg'd a water during the time of dissection, with which some vessels were also turgid, that were prominent, here and there, upon the surface of the skin in the feet and the legs. In both the cavities of the thorax, also, was a great quantity of water, of a yellowish colour. And there was a large aneurism, into which the anterior part of the curvature of the aorta itself being expanded, had partly consum'd the upper part of the sternum, the extremities of the clavicles which lie upon it and the neighbouring ribs, and partly had made them diseas'd, by bringing on a caries. And where the bones had been consum'd or affected with the caries, there not the least traces of the coats of the artery remain'd: to which, in other places, a thick substance every where adher'd internally, resembling

sembling a dry and lurid kind of flesh, distinguish'd with some whitish points; and this substance you might easily divide into many membranes, as it were, one lying upon another, quite different in their nature from those coats to which they adher'd, as they were evidently polypous. And these things being accurately attended to, nothing occur'd besides that was worthy of remark.

10. The deplorable exit of this man teaches, in the first place, how much care ought to be taken in the beginning, that an internal aneurism may obtain no increase: and in the second place, if, either by the ignorance of the persons who attempt their cure, or the disobedience of the patient, or only by the force of the disorder itself, they do at length encrease, so that they are only cover'd by the common integuments of the whole body; that then we ought to take care lest the bandages, especially when they are already dried to the part, be hastily taken off: and finally, if the case proceed to such an extremity, that the rupture of the skin is every day impending, and bleeding, either on account of the constitution or infirmity of the patient, or on the score of other things which I have hinted at (*m*) already, is dangerous; that every thing is to be previously studied, by which, for some days at least, life may be prolong'd. That is to say, besides the greatest tranquility of body and of mind, and the greatest abstinence that can be consistently observ'd, so that no more food be taken than is barely necessary for the preservation of life, and that in small quantities, and of such a quality as is by no means stimulating; besides that situation of body, by which the weight of the blood being lessen'd, does not press upon the skin, and other things of the like kind; something ought to be thought of by the surgeon, by way of defence; as, for instance, if the bladder of an ox, four times doubl'd, were applied, or a bandage of soft leather; and the edges of this bandage were all daub'd over with a medicine, by which they would be firmly glued down to the neighbouring skin that lay around the tumour, and was as yet sound and entire. But you will judge better of these things; for as to me, carried away with a desire of preserving a man's life, though but for one short hour, I perhaps talk foolishly. As to streight bandages, and plates of elastic steel or the like, I say nothing of them; not so much on account of those things which Lancisi (*n*) has observ'd, of the most considerable injuries being brought on by them in process of time; for the question is not at present, how the patient may live the longest time he possibly can, but only how to prevent his dying immediately; as on account of the skin being extenuated, in which case all pressure is dangerous. However, in regard to the three patients who may be compar'd with this that we have describ'd, and who were dissected by Wagnerus (*o*), by Lafagius (*p*), and Lentilius (*q*); you may see what was applied in the last, in order to retard the torrent of blood; although in the second only, nothing now remain'd but the attenuated skin to be broken through by the impetus of the blood; for which reason the event was the same in him as in this man of mine; so that as soon as

(*m*) Epist. 17. n. 31. & seq.

(*n*) De Aneurysm. Propos. 38.

(*o*) Eph. N. C. Dec. 3. A. 5. Obs. 179.

(*p*) Aët. Erud. Lips. Suppl. T. 3. S. 9.

(*q*) Eph. N. Cent. 1. Obs. 96.

the tumour began to be ruptur'd, at the same time a vast hæmorrhage and death were brought on.

As to what remains, this example of mine, of a very speedy death, from the bursting of an aneurism externally; although I confess that it does not so immediately belong to our present design, because that cannot be call'd sudden, which was evidently known to be at hand, and foretold; I nevertheless produc'd here, in order to lay before your eyes a kind of picture, as it were, of the internal rupture of an aneurism. For when the coats of the artery are extenuated, just as we have seen in the skin, it must of course happen that an aperture is made, and that the blood is pour'd out in the same manner that I have describ'd to you formerly (*r*), in a woman, from my own observation; and as I shall describe to you now, in a man, from an observation, which being taken in the latter end of November, in the year 1708, by the very accurate Sanctörini, he communicated to me the day following, when he was returning to Venice together with me.

11. A robust young man, who had been us'd to live on board of the gallies, being subject to a disorder which persons among the Venetians, who are not acquainted with physical matters, call *flato*; supposing it to be from wind, notwithstanding it is frequently join'd with some internal and organic disorder; was seiz'd with a difficulty of breathing after any violent motion. Two other things were also observ'd by his companions; the one, that he was accusom'd to become immoderately sleepy after food; and the other, that he us'd frequently to apply both of his hands to his loins, and rub them strongly downwards, as if he felt some uneasiness in that place, which was alleviated by these frictions. This man died suddenly, as he was sitting by the fire-side, in a house of ill fame. His body being examin'd, of which neither the legs or the belly appear'd swell'd, and this cavity being open'd, the diaphragm was found to be depress'd. The right cavity of the thorax contain'd a great quantity of extravasated blood. This had issu'd forth from the great artery; which being now very near to the diaphragm, had there dilated its own trunk into an aneurism of the bigness of a fist. And this aneurism, being fill'd with polypous and with membranous concretions, as it were, was ruptur'd quite through on the right side; and on the left side had so injur'd the bodies of the neighbouring vertebræ, that a large bony scale was drawn off from them without the least difficulty. However, there was no ossification in the aorta. The heart was very hard, and contracted into itself.

12. That the heart may be convuls'd, is already said in the former letter (*s*). An example of which kind you have, unless I am deceiv'd, in this young man, but to be attributed to another cause. However, that after food he became more sleepy than others, seems to be owing to the aneurism, and to the distension of the stomach; which although at that time it turn its fundus forwards, yet in proportion as it occupies more space itself, so much the less, how-muchsoever the abdomen may yield, it leaves to the other viscera of the belly; so that the sanguiferous vessels being there compress'd, the blood is carried to the brain, to which the passage is more free and easy. If, therefore, from

(*r*) Epist. 21. n. 47.

(*s*) n. 13.

this cause others become more prone to sleep, this young man was so much the more prone thereto, from the same cause, as by reason of the aneurism being situated in that place, the course of the blood downwards was still more obstructed. The other circumstances of this history it is easy to explain; and among these, the rupture of the aneurism being brought on, particularly, in that house, where, perhaps, he did not sit by the fire when it happen'd. Without doubt, many things are very often forg'd by the women and the friends of the patient, for the sake of making the affair seem more decent. See what Lancisi (t) has suspected, in regard to the sudden death of another young man, in a similar place. He was also said to have come "near the fire, for the sake of warming himself." What if it was that fire of which Parmeno, in Terence (u), if I rightly remember, says,

Accede ad ignem hunc; jam calefces p'us satis.

Come near to this fire, and you will be abundantly warm'd.

But the Deity, nevertheless, who is the avenger of sin, does not always suffer it to be conceal'd, how he punishes in the crime, by the crime itself. Which might be easily understood in the case of that soldier, whose "sudden death happening in" *estu venero*, "with a horrible clamour and "tossing of the body," is related by the celebrated man Christian Vater (x); and that from an eruption of blood into the pericardium, without doubt from some pretty large vein (y), if there really was no "rupture of the heart, or "auricle." But it is still more clear in that dreadful case, which the following history will inform you of.

13. A strumpet of eight-and-twenty years of age, of a lean habit, having complain'd for some months, and particularly for the last fifteen days, of a certain lassitude, and a loathing of food, and almost of every thing, for this reason made less use of other aliments, and more of unmix'd wine; to the use of which she had been always too much addicted. A certain debauchee having gone into the house to her, and after a little time having come out, with a confus'd and disturb'd countenance, and she not having appear'd for two or three hours after, the neighbours, who had observ'd these things, entering in, found her not only dead but cold; lying in bed with such a posture of body, that it could not be doubted what business she had been about when she died, especially as the semen virile was seen to have flow'd down from the organs of generation. I was, therefore, ask'd, whether I desir'd to have the genitals or not? and whether I would have the other viscera also? I answer'd, that I should be glad of both; not that I expected to see any thing particular in the organs of generation, now that the semen had flow'd out, but that I wish'd to take fresh notice of some things which I had often observ'd; for I conjectur'd, as I then said, that the cause of this sudden death would certainly be found to consist in the rupture of some large vessel. It was at this time extremely hot, it being June of the year 1725; nor were we allow'd to dissect the body till about the latter end of the following day. For which reason, changing my design, I sent my friend Mediavia to ex-

(t) De Subit. Mort. Obs. Phys. Anat. 2.

(u) Eunuch. Act. 1. Sc. 2.

(x) Eph. N. C. Dec. 3. A. 9. Obs. 163.

(y) Vid. infra, a. 26. & 27.

amine all the parts; and to take care to bring home the principal of them only to me.

The neck was livid under the chin, yet without any marks of force having been externally applied. The back was also somewhat livid. The abdomen was tense, and did not shew any mark of the woman's having ever been pregnant. The uterus being taken away, the small intestines appear'd very red. The large intestines, and especially the lower ones, were full of excrements: the stomach was very large, although almost empty. There was serum extravasated in the belly, to about the quantity of a pint; not unlike turbid water in which fresh meat had been wash'd; and so acrid, that it affected the extremities of the fingers with the sense of a kind of heat. In the thorax, the lungs were so far of their natural colour, that they were not black even on the posterior part. But the pericardium was so distended, that no sooner was a little wound made into it, but a serum burst forth, of the same nature with that which had been seen in the belly. Yet still a great quantity remain'd, and under it a black and firmly-concreted blood cover'd the surface of the heart. Which being brought to me on the following day, in the morning, together with the large vessels and the genitals, I observ'd, before I cut into them, that neither the heart itself, nor the trunk of the great artery, was dilated; and even that both of them, by their smallness, corresponded very well with the stature of the woman, which they said had been rather small. Being then about to lay open that artery from the inferior extremity, which was at the septum transversum, and having seen that one side of it, not much higher, was black to the extent of five or six fingers breadth; I found that this was owing merely to the effusion of blood into the cells of the external coat; for the other parts were quite in their natural state. But an internal disease began from the left extremity of the curvature of the aorta, and going from thence quite to the heart, became so much the larger in proportion as the artery came nearer to the heart. That is to say, in some places whitish marks of a future ossification occur'd; in others, some small foramina, as it were, had begun to be form'd; and in still other places were parallel furrows, drawn longitudinally: and in this manner was the surface of the artery unequal here and there. But when I came near to the semilunar valves, which seem'd to be lank and contracted, at the distance of half an inch above that which lies on the back-part, was an orifice that would have admitted the end of a man's thumb, by means of which the aorta communicated with a roundish aneurism, that hung to it in the form of a sacculus. This sacculus exceeded the size of a walnut before it is stripp'd of its green coat; and was so plac'd at the back of the aorta, that, as it inclin'd a little to the left side, it seem'd that it could not happen otherwise, but it must have obstructed the offices of the left auricle, or the adjoining sinus. And it had been ruptur'd in the upper part by the blood flowing from thence into the pericardium through a small foramen, the edges of which were lacerated and black. The internal surface of the sacculus was invested with red and polypous pellicles, which, like the texture of an onion, you might divide into as many strata or lamina as you pleas'd. But in the auricles and the ventricles of the heart, neither was there any polypous concretion, nor did the least quantity of blood remain.

Having

Having found these appearances, I turn'd my eyes and knife to the uterus, the ovaria, and the tubes. One of the tubes had the extremity of it grown into one substance with one of the extremities of the ovarium. And the extremities of both tubes were quite shut up; so that no orifice, nor fimbriae, any where appear'd. But as both the tubes were somewhat wider than usual at that part, they shew'd, when cut into, even somewhat more than usual of that humour which belongs to it, and which has been by some taken for the semen virile; but this issu'd forth in a very thick state, and in the end was even somewhat bloody. That ovarium, to which I said that the tube was attach'd so as to form one substance with it, contain'd a great number of vesicles, and those of a pretty large size. And although both of them were somewhat round, smooth, juicy, and turgid; one of them was, however, rather enlarg'd, because, besides vesicles of that kind, it had, on one side, under the very membrane of it, a black and almost coagulated blood, the quantity of which was, in proportion to the bulk of the ovarium, not inconsiderable.

Finally, in the uterus was nothing worthy of observation, except that the interior surface of it only was of a brown colour, mix'd with red, and that universally, even to the internal borders of the os uteri. This aperture was narrow; but disfigur'd with a kind of white and thickish humour, which, as it was not only unlike the semen virile, but also unlike that mucus which is generally found there in the natural state of the parts, gave us a suspicion of some kind of fluor under which this woman had labour'd.

14. They who contend that the male semen reaches quite to the tubes of the woman, carried away by a similitude which has not only impos'd on "good physicians," as Hippocrates says (*a*), but also sometimes imposes upon anatomists; would suppose, on this occasion, that the whole of the semen had not flow'd out of the pudendum of this woman. For me, however, whose intention it is not by any means to call into question what the greatest anatomists testify that they have sometimes seen, but what some others determine to be the more frequent and the more certain; it is sufficient to have related what I had myself observ'd. But although Donatus (*a*) has collected many examples of those who died suddenly in the act of venery, yet he has not taken notice of all that he had it in his power to take notice of; since Pliny alone, in that very place which he quotes (*b*), has not produc'd two only, but four.

Yet amongst these he has produc'd no example of a woman, if you except those who had been kill'd by debauching with an unsufferable multitude of men at one time. Nor has Schurigius (*c*), although he collected all the examples of deaths of this kind from every author, found any example that relates to women, two instances excepted, which not the histories of physicians, but certain inscriptions have supplied; and whether these were genuine or forg'd, neither he, nor those from whom he copied them, have enquir'd. And although Valerius Maximus (*d*) says, that those persons who have died thus, have not died "by reason of their own lust, but merely from the frailty of

(*a*) Epidem. l. 6. vers. fin.

(*a*) De Med. Hist. Mirab. l. 4. c. 17.

(*b*) Nat. Hist. l. 7. c. 53.

(*c*) Spermatolog. c. 5.

(*d*) Fact. ac Dict. memorab. l. 9. c. 12.

“ human nature; for that the termination of our life being expos’d to various
 “ and occult causes, this event is frequently attributed to causes which are
 “ by no means accessary to it, as they rather happen at the time of death,
 “ than give occasion to it of themselves;” yet dissection, and reason also,
 sufficiently demonstrate how much the indulgence of venery, added to those
 causes, accelerates death, by exciting the circulation of the blood, and by
 bringing on a rupture of occult aneurisms, or even by bursting some weak
 vessels within the cranium: which, without this or some other similar cause,
 would have continu’d to do their offices much longer, and perhaps even to
 old age, as had happen’d in that man in whom I observ’d what I shall imme-
 diately subjoin, and whom I dissected in the college the year before I dissected
 that strumpet.

15. A fat old man, of about sixty years of age, had died suddenly of an
 apoplexy, as was suppos’d by those who had known him to labour under a
 tremor. The pericardium, according to the account brought to me, (for I
 did not dissect this, though I did the other parts) was distended with as great
 a quantity of blood as two glass vessels, in which the blood taken from a vein
 is generally receiv’d, would contain. The heart was enlarg’d, and the great
 artery dilated above the heart; and even in its whole curvature was distin-
 guish’d, on the internal surface, with bony scales, some of which kind were
 also found in the arteries of the limbs. From the same surface, not at a great
 distance from the heart, a foramen big enough to admit a finger took its origin;
 and going on through the coats in an oblique course of almost four fingers
 breadth, from below upwards, it at length open’d on the external surface of
 the artery within the pericardium. And by this passage the blood had been
 discharg’d into that cavity.

16. Although it does not certainly appear at what time the aneurism began
 in this man, yet it is most probable that it had begun at the same time of
 life in which most others begin. At least, those diseases of the artery that I
 have describ’d do not seem likely to have happen’d within a short space of
 time. Diseases similar to these were discover’d by their proper marks, for two
 or three years before death, in a woman whose similar exit from this life I
 shall immediately relate.

17. A woman, of a fat habit of body, of fifty years of age, of a sober
 disposition, and naturally rather inclin’d to sadness and taciturnity; who had
 already been fourteen years a widow, being subject to no disease, except that
 for the last two or three years, that is, ever since her menses had been leaving
 her, she had been every now and then troubl’d with a kind of wind, as she
 call’d it, about the heart and its neighbourhood; having risen early in the
 morning to her work, for she was by trade a weaver, and having got every
 thing in readiness that is necessary to begin a new piece of work, cried out
 Oh! and spoke not another word, but died instantly, as she lean’d with her
 arms on the beam. It was the same month of the year 1729, in which, as I
 formerly wrote to you (e), so many others in this city were taken off by a
 sudden death; wherefore, although this woman died in the country, in that
 part which is call’d Pons Medoaci, taking its name from our neighbouring

river, yet thither the physician and surgeon whose business it was, were sent to dissect the body.

The neck and arms were rigid; so that they could not be bent without force. The cranium being cut open, a great quantity of blood immediately flow'd out; and it seem'd to them that some vessel betwixt the cerebrum and cerebellum was ruptur'd. This, however, was more certain, that when they examin'd the thorax, the pericardium was so extremely distended, that when they made a puncture into it, a bloody serum rush'd out. And the remaining part of the blood adher'd about the heart in a coagulated state, like a pretty thick bark. Nor did they only relate these things; but they brought the heart, with the vessels annex'd to it, in an untouch'd state, with them, that I might examine them accurately. And this I did on the day after, while the same persons and others assisted; and I found the parts in the following state: The heart was small, but, nevertheless, furnish'd with fat, of a healthy appearance, and, as far as relates to the left ventricle, with pretty thick parietes. There was no blood in that or in the other cavities, nor any in the large vessels; I do not say fluid blood, but even not coagulated, and still less polypous. All the other parts of the heart were found, if you except the borders of the valves that are call'd tricuspides and mitrales, inasmuch as they were universally distinguish'd by a small, roundish, and fleshy kind of tubercles, resembling glands. But these appearances are, certainly, not rare; and, indeed, have been already describ'd to you in many bodies. This, then, being the state of the heart, and nothing being found to exist that was preternatural in the other vessels which are annex'd to it, the great artery was the only one that remain'd to be examin'd. Having, therefore, open'd that tract of it which was fix'd to the vertebræ of the thorax, and having first observ'd a whitish spot, and in the next place, at a long interval above this, another of a larger size, and of a yellowish colour, the marks of a future ossification; I in like manner saw, internally, an oblong, but small prominence, where the artery began to descend, form'd of the natural substance of the artery, but itself by no means natural.

After this, before I continu'd to open it farther, I observ'd that the artery was, from that part whence it sends off the left carotid, almost quite to the heart, much wider than it ought naturally to be. But soon after, having laid it quite open, I saw, in the whole of this large extent, which I said was dilated, that the artery was internally rough and unequal, by reason of rigid and hard bony lamellæ which were so thickly sprinkled, and in so great a number, as scarcely to leave some very small intervals betwixt them. And as, in these intervals, the internal coats of the artery were perceiv'd to be corroded and attenuated by a kind of ulceration; it was surprizing that what any one would suppose might have happen'd, in so many other places before, should at length only have happen'd in one place, and that at the posterior part of the tube, and somewhat to the left. That is to say, the blood had, by degrees, made itself a way through one of the intervals of this kind, and had come out under the external coat of the artery; and first by drawing it from the internal coats, and then by raising it, as a large kind of ecchymosis, which itself had form'd, by coagulating there, demonstrated to us; and finally, by distending it more and more, had burst

through this external coat in one place, and had pour'd itself out within the pericardium. However, those branches which went to the head and the shoulders, notwithstanding they came from so diseas'd a stock, were all of them, as far as I could conjecture from the parts of them which were annex'd, entirely sound.

18. In regard to the bony lamellæ, and the ulceration of the aorta, that attended them, I shall enquire into these in the next letter, to which, for this reason, I defer a singular observation, that otherwise belong'd to this place (*), which is an observation communicated to me by a celebrated man, of a sudden death from blood having fall'n into the pericardium through a foramen of the great artery, which was much diseas'd. But you, in the mean while, wonder that those deaths should be so sudden (f), from no greater a quantity of blood being extravasated than the pericardium can contain: the capacity of which is so defin'd by Boerhaave (g), as to be twice as big as the heart; and by Fantonus (h), that besides the heart, it can receive "almost two pints" of water. And if we suppose it to be, not only fill'd, as they have suppos'd, but also distended, as is shown in the women that I have describ'd (i), by the serum issuing forth with such an impetus; and if we even suppose it to be relax'd besides, as in the old man (k), so far as to be able to contain the quantity of blood they related; yet we ought not to forget, you will say, how much a greater quantity of blood, beyond any comparison, sometimes comes forth in hæmorrhages within twelve or fifteen hours, as Littre testifies (l), without bringing on death; not to mention the ancient examples which are extant in Schenck (m), of twenty pounds of blood being discharg'd within five days, and even within one day and two nights; or of forty pounds flowing within six days from the nostrils, or of twenty-five within three days from the uterus, without the lives of the patients being destroy'd thereby: and that women, in particular, have in general more blood, and more easily bear evacuations of this kind, does not seem at all doubtful: and as things are to be consider'd in this view, it seems probable, that the woman of whom I spoke last, was, perhaps, taken off by an apoplexy, rather than by the rupture of that aneurism.

If you say thus, I shall beg of you, in the first place, to attend to the difference that there is, betwixt a large quantity of blood being discharg'd at once, and a far greater quantity being discharg'd in the course of many hours and days; and in the next place, betwixt blood flowing from the very trunk of the aorta, near its origin, and that which flows from the distant branches of it; and, finally, betwixt that which is discharg'd within the pericardium, and on the outside of the body. And the first difference will show you, that in this case there is not sufficient time for the vessels to contract themselves about the remaining quantity of blood; nor yet for the blood to receive any supply, from which the parts of this fluid would become contiguous to each other, and to the coats of the vessels internally, without which

(*) n. 28.

(f) Vid. & Epist. 64. n. 13.

(g) Prælect. in Instit. § 182.

(h) Anat. corp. hum. Diss. 11.

(i) n. 13. & 17.

(k) n. 15.

(l) Mem. de l'Acad. R. des Sc. A. 1714.

(m) Obs. Med. l. 1. ubi de Narib. Promisc. Obs. 4. & l. 4. ubi de Menstr. hypercath. Obs. 7.

the circulation of the blood cannot be carried on. And from the second difference you will, at the same time, perceive, that a proper quantity of blood is suddenly withdrawn from the whole body. And from the third you will conclude, that the heart is certainly injur'd by the unusual contact of blood externally, and that by the quantity of this fluid lying round it, the proper action thereof is impeded: and that if a fluid distend the pericardium, it must also press upon the heart.

Nor let it be any objection with you, that in a dropſy of the pericardium the heart continues to be mov'd; for it is one thing for the water to be gradually increas'd, and another thing for the blood to be suddenly extravasated; one thing for the heart to be press'd upon by water, and another to be press'd upon by blood; which, besides that it is prone to coagulation immediately upon effusion, without doubt approaches the more nearly to the nature of solid bodies, in proportion as it is thicker than water; and if a solid body be applied to the heart, it immediately brings on a syncope, by stopping the motion of it, as the very celebrated Senac⁽ⁿ⁾ demonstrates, by the examples of a probe, or a finger, being applied to it, in the cases of two wounded men, in whom that symptom was thereby brought on. Or if these are not sufficient, add thereto the two first differences I mention'd. Add also, that the trunk of the aorta was dilated, and that the fleshy fibres being in great measure eroded, it had rigid little bones within: and it is very evident how much difficulty must be thrown in the way of the blood's circulation, by circumstances of this kind; and consequently, how much greater powers of the heart are requir'd, in order to overcome them, which, it is very certain from what I have already said, were greatly weaken'd and injur'd. But if all these considerations, summ'd up together, should perhaps not be able to satisfy you, and you would rather choose to suppose, that this woman was taken off by an apoplexy, by reason of that quantity of blood which appear'd within the cranium, than by the rupture of the aneurism, read the histories of two women that follow, which are not much unlike the one already given; except, however, that no blood at all, not to say that great quantity which seem'd to be extravasated within the cranium, was found by us.

19. About the middle of May, in the year 1738, a woman of more than thirty years of age was carried off in this place, by a sudden and unexpected death. The belly and thorax being open'd, in the former a little extravasated water was found by our Mediavia, but in the latter none at all; however, the pericardium was fill'd with blood, from an aneurism of the great artery being ruptur'd within it; into which aneurism, not only the whole curvature of this vessel had dilated itself, but also the part nearest to the beginning of that curvature.

The head and the greater part of the viscera I dissected myself. But within the cranium I found no greater quantity of blood than what was sufficient to render the vessels of the pia mater moderately turgid, as they in fact were, and to furnish the small red drops, that appear'd up and down in the medullary substance when cut into. In the lateral ventricles was no great quantity of turbid water, nor any paleness in the choroid plexusses. But the other cir-

cumstances that I observ'd in the brain, the nerves, the ears, and in other parts, and particularly in the renes succenturiati, do not relate at all to the present subject; for this is that woman from whom I describ'd the right of these bodies as endow'd with a peculiar form, in the twentieth anatomical epistle (e).

20. I will now subjoin the whole of that observation, one small part of which only has been given in the sixth of the *Adversaria* (p). For although it was the first wherein I saw an aneurism of the aorta ruptur'd within the pericardium, yet I design'dly deferr'd giving you the relation of it till at present, because it contains many and various things, and requires many and various remarks.

21. A Venetian woman, of the same age as the last I have describ'd; of a stature, colour, and habit of body that were laudable, but rather fattish; being the mother of many children; and having been, ten years before, seiz'd with a palsy of the lower limbs, was said to be made sound by the use of rosemary; or, at least, she had been subject to no inconvenience from that time, which was worthy of remark: but, for some months past, had labour'd under a difficulty of breathing, which, however, was not continual; and besides this, with a pulsating tumour that ran upon the neck, longitudinally, in the region of the right carotid artery; yet never (which you will remark, on account of those things that we found in the dead body) did she complain of any pain, numbness, or tumour of the right arm. But four or five days before her death, she complain'd of a troublesome kind of sensation, just as if her ribs, as she said, had fall'n towards the abdomen; when, on a sudden, about the middle of December, in the year 1708, being seiz'd with a kind of fainting, and affirming that she should die, she was with great difficulty supported by the women, who ran to her, and plac'd her in bed; where, her face, and particularly her lips, being livid; she, being cold and senseless, with a very small pulse, a difficult and slow respiration, departed this life, in less than a quarter of an hour from the time of her being attacked.

Upon inspecting the body, it exhibited no cedematous tumour in any part, or any thing else that was worthy remark; but when the belly was opened, some parts of the intestines appear'd to be, as it were, inflamed, if you attended to the colour: which colour was soon after obvious in the pancreas also. But upon examining the small intestines more attentively, in one part of them, to the length of a man's hand, appear'd some very small and innumerable tubercles of an obscure kind, which were nothing else but tokens of the cells, that being distended with air, betwixt the fleshy coat and that which lay beneath it, lifted it up outwards; the air, therefore, having escap'd, by means of wounds in the nearest sanguiferous vessels, these cells collaps'd.

In the gall-bladder were four or five little stones, of an unequal magnitude among themselves, which being applied to the flame took fire. From the vena cava, when cut into, a considerable quantity of blood flow'd down; but from the great artery only a small quantity. The viscera of the belly being

(e) n. 53.

(p) Animad. 24. in princip.

now sufficiently inspected, and for that reason remov'd, it was evident that the diaphragm did not ascend, on both sides, in the form of a vaulted roof; but that it rather fell downwards.

When the thorax was open'd, we saw that a very bloody serum had been extravasated in both the cavities of it, to the quantity of a few ounces: but that the lungs were found, although something turgid; for the bronchia, and especially the left, as I afterwards saw, were fill'd with a serum like that I just now spoke of. In the mean while, the pericardium, by its tumid and livid appearance, had given marks of its having blood extravasated in it: with which, however, it was not full; but contain'd somewhat less than a pound; about two ounces of which were a bloody serum; the remaining part of the blood having form'd itself into a thick and pretty firm lamina: whereas all the blood that I saw in this body was black, indeed, like this, but quite fluid. The blood being taken from the pericardium, as we saw that the aorta, as soon as ever it came out from the heart, was manifestly dilated, by pursuing the trunk and the principal branches thereof, I found that the former of them was dilated almost quite to the emulgent arteries, and that the branch of the aorta, which is itself a common trunk of the right carotid and subclavian, and, in like manner, that both of these branches were so dilated, as to make the breadth of the carotid, from the beginning of it quite to the division, more than twice as large as it ought naturally to be; and the subclavian artery, to the extent of three inches, was not expanded equally on all sides indeed, but had its posterior and superior paries only curv'd out into a prominent aneurism; by means of which, nothing at all being interpos'd, two or three nerves, of those that go from the neck into the upper limb, were compress'd. From this aneurism, which would have admitted my thumb, two arteries proceeded: these having a broader beginning than they naturally have, put on the form of a cone, and the farther they proceeded the more they were contracted; till having measured out the space of an inch and a half, they were reduc'd to their natural dimensions. One of these went to the thyroid gland, which was in this woman large, and in some places hard.

After having examin'd all these parts externally, I began to lay open all these vessels, and even that part of the aorta which had been in the belly, in a longitudinal direction, beginning with the iliacs. And from these arteries quite to the emulgents, I found no appearance of disease, except whitish spots in some places, and very small furrows here and there. But as the dilatation of the trunk began above the emulgents, so from thence, quite to the heart, the parietes of the artery were much thicker than they usually are; yet not equally in every place, and were, in like manner, more hard and rigid than usual; although I found no where any appearance of ossification; but in some places whitish spots, in others very considerable parallel sulci, drawn in a longitudinal direction, and so much the more remarkable, as they were interrupted, after having run over a short space, by other transverse sulci, the direction of which was not near so strait; after that others follow'd, similar to the former, which were presently interrupted by transverse furrows; and after these still others in the same manner: so that in this morbid constitution a kind of elegant order was preserv'd quite to the whole arch.

of the aorta; and, indeed, it was continu'd from this curvature into the left subclavian to the extent of an inch; into the neighbouring carotid to the extent of two inches; but into the other through the whole of it, together with the spots, the thickness and hardness of the coats. But that aneurism of the subclavian resembl'd the structure of an auricle, as it were, of the heart, form'd of an unequal, hard, and thick coat, not internally lin'd with polypous laminæ, or strata, but only having a very small, whitish, and oblong jagged concretion adhering to it; besides which, I found no other polypous concretion in the whole body.

Finally, the trunk of the aorta itself, from that place where it sends off its first branch to the upper parts quite to the heart, was both distinguish'd with spots, and mark'd out into furrows; but these were so confus'd and irregular, that nothing but a perpetual and very great inequality of that surface appear'd. Yet, besides this, a kind of ulceration, as it were, was found about two inches above the semilunar valves, where the artery looks towards the right and posterior parts; and in that ulceration were three or four very deep foramina, very near to each other, each of them of the bigness of a lentil, but of an angular form rather than round. From these foramina, winding sinusses were carried obliquely outwards, and reach'd to the external lamina of the aorta; which was in that place, therefore, of a brownish colour mix'd with red, as if in consequence of inflammation, and become much thicken'd by a great flow of moisture: and in the middle of that redness, the lamina being at length lacerated, the blood had made a way for itself into the pericardium, by a foramen similar to the internal foramina, and almost of the same magnitude.

The left ventricle of the heart was greatly dilated; but the auricle that lay close to it, was very much contracted and thin. In that ventricle, and in the right, blood was not wanting; and in the pulmonary artery there was a great quantity; nor were the carotids, nor the jugular veins, devoid of it.

Finally, I found the cerebrum and cerebellum to be very lax, notwithstanding there was no water in the ventricles, a very little of which was found in some places only under the pia mater. The vessels of this membrane were somewhat turgid with blood. The vertebral arteries, where they enter'd the cranium, seem'd to be a little wider than usual. The other circumstances that were remark'd in this body by me, and by my friends, that assisted me in the dissection of it, relate to other subjects.

22. There were found in this woman four aneurisms at least; one of the left ventricle of the heart, one of the greater part of the aorta, one of the right subclavian, and one of the carotid on the same side; so that there not only appears to have been sufficient causes for the symptoms with which the woman was troubl'd, but it is even surprising that she had not been afflicted with more. As to the aneurism of the carotid, which discover'd itself by its prominence and pulsation, although I readily confess that these arteries are sometimes dilated, from peculiar causes that affect them in particular; yet that their dilatation is join'd more frequently with the dilatation of the aorta, and is even a propagation and effect of it; nobody since the time that the causes of diseases were begun to be enquir'd into, by frequent dissections, will deny. The ancient physicians, indeed, being in want of this assistance

to their enquiries, seem'd to suspect nothing of that kind; and thought that they had nothing else to do in an aneurism of the carotids, than to make a revulsion of the blood; to diminish and correct the acrid particles in it; and, finally, to apply such things as had a property of contracting and constringing the coats of the arteries; as you will very clearly perceive from reading that chapter of Arantius (*q*), in which he particularly treats of this aneurism. But if any one attempt to constringe the artery, when it is a production or effect of an aneurism of the great artery, he will encrease the latter, and not remove the former; but he even will not be able to effect this, when it is only from an eroding cause, as Lancisi (*r*) shows, by producing an example of a noble matron.

23. But as to the aneurism with which the right subclavian artery press'd upon the nerves that went to the upper limb, without any thing at all being interpos'd, I enquir'd in the sixth of the *Adversaria* (*s*); where, by I know not what negligence, "the left subclavian" is written instead of the right; I enquir'd, I say, why no mark of this compression had existed in the living body? Nevertheless I still enquire. For since pains, as is frequently the case, and was the case in the man whose history is written above (*t*), or numbness, happen to those in whom an aneurism is form'd in the trunk of the aorta itself, above the heart; I see that the circumstance is explain'd by learned physicians, by means of contractions, which being propagated from that trunk into the subclavians, compress the same brachial nerves whereof we speak at present; why then are not these nerves so much the more compress'd by an aneurism seated in the subclavian itself, and contiguous to them? For although other very experienc'd men are not wanting, who affirm that sense and motion has, finally, been observ'd to be quite uninjur'd in that part to which the nerve goes, when the nerve has been not only compress'd, but even for a long time closely confin'd by a ligature; yet they do not, nevertheless, deny, that immediately after the ligature was put on, at least some loss of sense and of motion had been perceiv'd. Is the reason of this that the nerves bear with impunity that compression which is brought on gradually, and gradually encreas'd, by custom accommodating themselves thereto? But of these things you will consider, as also of the great number of experiments which have been lately made by more than one person, in which some circumstances occur in a different manner from what I have just pointed out, that ought not to be pass'd over with neglect: and you will likewise consider of those observations, which I here purposely pass over, from which, perhaps, it would not be altogether absurd to conclude, that the small branches of other nerves which communicate with the branches of those that are tied up, may, by degrees, and after some time, be able so to dilate their tubular cavities, as to carry supplies to them transversely, in the same manner as happens in the sanguiferous vessels.

Of these things, I say, and of others you will consider. For what I was unwilling to do then, I am equally unwilling to do now; I mean, to entangle myself in abstruse and tedious disputes about the nerves. It is much

(*q*) De Tumor. pract. nat. c. 38.

(*r*) De Aneur. Propos. 31.

(*s*) Animadv. 24.

(*t*) n. 9.

better to remark every thing that occurs to each of us upon the subject, till a proper number of observations and facts shall show us what we may follow; sparing, in the mean while, some certain conjectures; and making inductions with caution, which, although they may be easily defended, yet we do not all attain to the knowledge of: how much less likely is it, then, that we shall attain to the knowledge of the truth, which is, as yet, so deeply mysterious and involv'd?

But you, perhaps, will rather ask on this occasion, why the disease, which was propagated from the aorta to the right carotid and subclavian arteries, was not equally propagated into the left carotid and subclavian? And this I should suppose to have happen'd for more causes than one. For, in the first place, the vessels on the right side are nearer to the heart than the left, if we consider their first origin. Wherefore, as the powers of the heart were preternaturally increas'd, the former began sooner than the latter to be weaken'd; for which reason, the disorder that afterwards began in the arteries on the left side, was, I saw, carried farther on in the carotid, in consequence of this vessel being nearer to the heart, than it was in the subclavian. And in the second place, whatever was the occupation or handicraft of this woman, in regard to which I have no certain information, it is highly probable, that she had been accusom'd to use her right arm more frequently, more strongly, and for a longer continuance, than she did her left; and that there is room here, in some measure, for the explication of the celebrated Maloet (*u*), who accounted for the dilatation of the subclavian artery in an artificer, from the more frequent, constant, and stronger contractions of the muscles of the right limb; that is to say, from the blood being retarded in the arteries of that arm which are so compress'd, and consequently more accumulated in the origin of these, the subclavian, which is by no means liable to those compressions. What? if in this woman another cause of that dilatation was added; I mean, stays, which are furnish'd, as Petronius says (*x*), *balenatiis virgis*, "with rods of whalebone;" which, by their too great hardness and confinement under the arm-pits, as frequently happens, would so much the more press upon the artery, in proportion as the artery should be more press'd against that hardness in the motions I have just now mention'd, and for that reason reflect the impetus of the blood, which was strongly driven by the heart into the subclavian artery, back upon this artery. And if you do not disapprove this supposition, you will add it to the other disadvantages that the very ingenious Winslow (*y*) has imputed to this kind of stiff stays about the chest, which too much constrict the axillary vessels.

Finally, if all these causes join'd together do not sufficiently explain the circumstance, call to mind what Celsus has very justly said (*z*): "It happens but seldom, that a person has not some part of the body more weak than the rest." And if you admit of this supposition, you will not only understand why that subclavian artery might be subject to an aneurism, but even why it might have one in that particular part.

(*x*) Mem. de l'Acad. R. des Sc. A. 1733.

(*y*) Satyric.

(*y*) Mem. de la même Acad. A. 1741.

(*z*) De Medic. l. i. c. 3.

24. But in regard to the aneurism, and the other disorders of the aorta itself, as we have made many remarks in other places, it will be sufficient to add only a few things at present, that relate in particular to these diseases. And first, that the artery was more thick and more rigid than usual; whereas one would naturally suppose that, by reason of its dilatation, it should have been thinner and softer; arose chiefly, in my opinion, from those very thick and whitish spots, which, as they are the beginnings of a future bone, are, in like manner, made up of an increas'd substance in that part, which approaches, as I have often observ'd, to the nature of that which is in the ligaments. And that these spots, and the other diseases of the heart, were so much the more frequent and considerable as the aneurism was less distant from the heart, you see was owing to the impulse of the impinging blood, which must be driven on with a greater force in proportion as it was nearer to the heart. For which reason no more need be said to make you conceive how it happen'd, that as a part of the aneurism was within the pericardium, it was ruptur'd within that cavity, as it also happen'd in many other cases which I describ'd above (*a*). We should rather endeavour to explain why the aneurism was ruptur'd at the posterior part of the artery (*b*). For as I saw it to be open'd in that part also in the woman-weaver (*c*); and as the orifice of the aneurism was likewise describ'd in that part in the strumpet (*d*); it becomes less probable that all these women had the same one part of the artery in particular weaker than the others. It is, perhaps, more supposable, that this circumstance was owing to the weight, and at the same time to the impulse, of the blood that came out from the heart, as the position of the artery seems to show; which, as it begins to incline to the posterior parts immediately from its origin, consequently subjects that part of itself to the weight of the blood, and at the same time lays it in the way of the blood's impulse.

Perhaps you also wish to know why, when the artery was ruptur'd, this woman did not immediately die also. I suppose, because the foramen was, at the first, much less than I found it; as appear'd from the blood being effus'd in less quantity than in other persons: although it was also effus'd in less quantity, and slowly, on account of the powers of the left ventricle of the heart (which had been formerly, indeed, when they distended the aorta, very great, but in the latter part of his life were weaken'd and broken down by all the disorders of the aorta itself) strongly, and for a long time, resisting; as the great dilatation of this ventricle demonstrated. And whether this slow extravasation of the blood, which entirely agreed with the very slight motion of the heart, as was signified by the pulse, was the cause of this blood's having coagulated in the pericardium; which was a circumstance that appear'd in no other part of the body whatever; or whether the water in this cavity, which, perhaps, by reason of the disorder in the heart, was previously morbid, could effect this concretion; or whether there might be any other more probable cause that escapes me now; I leave quite undetermin'd.

25. And as to the aneurism of the heart, and in regard to this of itself being frequently the cause of sudden death, I have already spoken of these

(*a*) N. 5, 15, 17, 19.

(*b*) N. 21.

(*c*) N. 17.

(*d*) N. 13.

subjects in other letters, and shall treat of them hereafter. It remains to add something upon that sensation which was troublesome to her in her last days, and seem'd to herself to be that of her ribs falling down, as it were. The ancient author of the book *De Veteri Medicina* (e) has said, that when they omit their dinner who have always accusom'd themselves to eat a dinner, their "viscera seem to them to be hanging downwards." And this had been handed down in so many words in the book *De Vitius Ratione in acutis* (f); and in that part too, which, from the testimony of Galen (g), is suppos'd to be "the most genuine work" of Hippocrates: nor did they judge differently in the time of Pliny, who would not otherwise have said (h), "that Hippocrates had dedicated one whole volume to the praises of ptisan;" for there is not the least doubt, but that by these words he meant the same part as Galen did, whether he attended to the long discourse that is made here upon ptisan, or whether he read this book in the codex, in which it was entitl'd *De Ptisana*, in which manner Galen (i) saw it inscrib'd, and under which title Cælius Aurelianus (k) has quoted it: which Duretus (l), who was a man in other respects very learned, may seem to have forgotten, when he has suppos'd that this title had been "given to it by Pliny," whose authority, rather than that of the Grecian manuscripts which they had in their hands, I suppose neither of these authors would follow in such a circumstance, as they have not, on any occasion that I know of, ever spoken of Pliny. And Dalechampius (m) thinks, that those very words of Hippocrates which I have quoted relate to this circumstance; since he has said in another place (n), for instance, "that Hippocrates asserts the entrails of those who eat no dinners to grow "old very soon;" for these words are interpreted thus, "that they are tortur'd with a pain at their præcordia, as if their viscera were hanging downwards." And the opinion of Thevartius is the same in the annotations to a certain consultation of Ballonius (o), except that instead of *senescere*, "or grow old," he judges that we should read *pendere & succrescere*, or, that they "hang and grow downwards." What if Pliny should not have had an eye to these words in that passage; but to that place of the second book *De Dieta* (p), where it is said, "To take food once in a day attenuates and "dries," - - but "that dinners have quite the contrary effects;" and so that in Pliny it should have been written *siccescere*, or "grow dry?" What if we suppose that one letter only has been alter'd, and that instead of *senescere*, or "grow old," it should be written *sanescere*, or "grow healthy?" On which supposition Pliny may be thought to have had some other passage of Hippocrates in view; which I omit to enquire after, as the opinion of Pliny, by reason of the corruption of his words in that chapter, seems to me to be not altogether so clear and certain as I could wish. But the opinion of Hippocrates in that former passage seems to be by no means obscure, notwithstanding different interpreters have thought that he meant quite different

(e) N. 19.

(f) N. 16.

(g) In l. 3. Epid. Comm. 2. in princip.

(h) Nat. Hist. l. 18. c. 7.

(i) In l. de Rat. Viâ. in Acut. Comm. 1. t. 18.

(k) Acut. Pass. l. 1. c. 12.

(l) Comm. in modo cit. Hipp. l. Schol. ad titul.

(m) In Annot. ad cap. mox citand.

(n) L. 28. c. 5.

(o) L. 2. 16.

(p) N. 25.

things. For Franciscus Vallesius says (*q*): “The viscera in these persons seem to be suspended; that is to say, they seem to be drawn upwards;” because the vessels being emptied, they are in a manner convuls’d.” Others, on the contrary, understand, that the viscera seem to be so suspended, that the patient feels them to be drawn, not upwards, but downwards; where, without doubt, the very weight of the viscera would draw them, just as if a kind of fulcrum, or support, were taken away; and that this fulcrum had before been the stomach, when it was fill’d with food. And to this opinion the interpretation of Duretus (*r*) relates, which I do not doubt but Ballonius had read (*s*), as he delivers the same thing in the same words. And this opinion Thevartius not only follows in his annotations, but even confirms the interpretation by another passage of Hippocrates (*t*); who teaches us, that in a fracture of the ribs, “a moderate repletion of the belly becomes a direction and support to the ribs; but that an emptiness of the belly makes the ribs hang downwards; and that this depending state causes pain.”

And Galen (*u*), in explaining this passage, is so far from doubting “whether the tumour of the belly is made a foundation for the ribs to support themselves on,” or, as he speaks soon after, “their seat and prop,” as to affirm, that “they who have pretty large bellies, are wont to be troubl’d with less pain if they have their ribs broken; and that they who have their bellies small and contracted, feel great pain from a fracture of this kind, as they feel the ribs weaken’d, and, as it were, suspended.” But it is more easy, you will say, to conceive of this, I mean, how the belly, when tumid, may support the ribs, than of the other; that is to say, how the stomach, when tumid, may support the viscera that are laid upon it. For although, when it swells, it may turn the fundus, not downwards, but forwards, and by this means be able to support the spleen, and the lower part of the liver; yet it cannot support the side of the liver, that is more to the right, which is much the heavier. And to this you may add, say some, the intestines that lie under this part, and under the stomach itself, and, in particular, the colon: for by this means you will perceive, that these parts and their vessels, being fill’d, sustain both the liver and the stomach equally. To which if you reply, that you do not enquire after this at the time when the intestines and the vessels are fill’d, but when the stomach only is fill’d; for that this sense of the viscera hanging down, as it were, is not then at length remov’d after the ingesta have reach’d to the intestines, and in particular to the colon, and fill’d their vessels, but long before; the same persons will know how to set the whole of the circumstance in a more distinct view, and clearly to show what the muscles of the abdomen contribute thereto, even when the stomach and the first part of the intestines are fill’d, and perhaps what that vigour which we feel diffus’d through the whole body the very moment that refreshing aliments are thrown into the stomach; I say, what this vigour contributes to affording these supports of which I spoke, and raising up the viscera in some measure. I think I have now said quite

(*q*) Comm. in Hipp. l. de rat. Vict. in Aeut.

(*r*) In Schol. ad ea verba.

(*s*) Consil. cit. 16.

(*t*) De Artic. n. 51.

(*u*) In eum Hipp. l. Comm. 3. ad t. 56.

enough, in order to make you understand from whence that sense of the ribs falling downwards, as it were, arose in this woman, whose strength and appetite were extremely languid, as the disorders of the great artery, and of the heart, proceeding from those causes that I have demonstrated, requir'd. To these, moreover, was added, what was observ'd in the dissection, to say nothing of the cerebrum being very lax, that the diaphragm, before the thorax was touch'd, did not ascend on both sides, but rather fell downwards: for if this had happen'd to be in some measure brought on in the last days of her life, by reason of the power of restoring themselves to a natural state being weaken'd in her muscles, you easily see that those parts of the diaphragm, from whence the liver by its right and left ligament, and the spleen, also, by its proper ligament, are suspended, are drawn downwards by the weight of the viscera; and that the ribs at the same time, inasmuch as they are annex'd to the diaphragm, are under a necessity of following this.

26. However, I partly know, and partly suspect, that others have before also lit on cases similar to these that are above describ'd by me. I know that Boschius had seen a case of this kind "twice;" for in the eighth section of the second book of the *Sepulchretum* (x), you will read that it was observ'd by him "twice, in those who labour'd under a palpitation of the heart, and "who having the coats of the aorta dilated, were seiz'd with a sudden death, "as it were, because the spirituous blood had rush'd headlong, in a manner, "into this coat call'd the pericardium;" for which reason the heart could not be dilated. And I suspect it, when I read in this eleventh section (y), that the body of a person "who died suddenly from anger," had shown "the pericardium to be fill'd with blood;" and "had two abscesses found "in the trunk of the artery, near the heart, from whence the blood had "flow'd out." For certainly it is much more probable, that they were two small aneurisms stuff'd up with polypous concretions, which, without examining the aorta internally, were taken for "crude and bloody or inflammatory abscesses, not yet suppurated:" such as could not be ruptur'd from anger, and when ruptur'd could not have pour'd out such a quantity of blood; although the great artery being even examin'd internally and externally in our times, and found to be corroded on both sides, near the heart, as I have often seen it, from whence the blood had burst suddenly into the pericardium, both this bursting of the blood has been consider'd as an uncommon case, and that corrosion taken for an abscess of the aorta, which was, however, better conceiv'd of, and explain'd.

But, to return to our suspicions; you have, perhaps, read the history "of "a very fat man, who complain'd of a palpitation and pain of the heart, "with an unequal, and sometimes a faltering pulse:" after whose death, which happen'd "suddenly, while he was at stool, the pericardium was found "full of coagulated blood, of a very black colour, and a very filthy odour; "and appear'd so form'd in the superior part, as to resemble, in substance, "the *renes succenturiati*." It is true, I would not pretend to deny that tumours of the pericardium may be form'd, which may be ruptur'd within this cavity; and I confess the ill smell of the blood agrees very well with a sup-

(x) *Obs.* 26. § 1.(y) *Obs.* 8.

position of this kind : but I say this nevertheless, that if any man more studious of, or better skill'd in, anatomy, had lit on that case, he would have set about to enquire, from whence so great a quantity of coagulated and very black blood, that is without any mark, as far as the eyes could judge, of ichor or pus, had suddenly proceeded, and whether the large vessels were found; and since, about these vessels, (for it was thus that he pointed out the upper part of the pericardium) that substance had appear'd, whether only one of them was eroded, or pierc'd through.

For this may happen not only to the aorta, of which I have spoken hitherto, but also to the pulmonary vein, and the vena cava, as I shall say presently; and to the pulmonary artery also, from the erosion of which, the celebrated Tabarrano (z) mentions, that blood bursting into the pericardium, had been the occasion of sudden death in the cardinal Boncompagno at Rome: and I formerly heard at Bologna, from my præceptors, who were his physicians, that he had been us'd to complain of most of the symptoms which are mention'd in the case describ'd just now. Whether, therefore, the blood had issu'd from the pulmonary artery, or from those veins, or, finally, from the aorta itself, (for I have found (a) the blood which had come from this vessel, to be black also, and not of a bright red) I leave quite undetermin'd, not only in the observation describ'd above, but equally in another likewise, which you read in Ramazzini (b), of "a man of sixty years of age, of a "very fat habit of body," who died a sudden death, and from whose "pericardium almost two pounds of coagulated blood were extracted;" and finally, in that which is extant in this section of the Sepulchretum (c), of a soldier "who died suddenly, after a long state of grief;" and who, at the same time that "the other viscera were found, had in the pericardium, not "only water, but also a great quantity of concreted blood." Where, notwithstanding, you will also see it inculcated in the scholium, that the heart had been overwhelm'd and oppress'd, "both by the quantity of water, and "by the blood," yet it is by no means necessary that you should believe there was any other water than the serum generated in a very considerable quantity, as frequently happens, from the remaining and coagulated part of the blood. In these histories, therefore, it is certain, that the blood had burst into the pericardium from some pretty large, or, at least, from some moderately-siz'd vessel being pierc'd through with a foramen, and not from a very slender one, especially if it was a vein; for the blood flowing down very slowly from a small vessel, or through a very small foramen, as it would have been increas'd to such a quantity gradually and slowly, would not have brought on so sudden a death. But from what vessels it had been discharg'd is uncertain, by reason of the unskilfulness or negligence of those who perform'd the part of dissector. For the blood being taken out, and wash'd away clean, a foramen of that kind could not be conceal'd, whether it was in the ventricles, or in the auricles, of the heart, which we here comprehend under the general name of vessels, or in the other vessels properly so call'd; and not only in the very largest, but even in those of a moderate

(z) Obs. Anat. n. 8.

(a) Supra, n. 21.

(b) Conf. Epid. Urb. A. 1691.

(c) Obs. 14.

size; of which kind, particularly at the basis of the heart, are the coronary vessels: for it was found that the blood, with which the pericardium was distended, in a matron (*d*), and, in like manner, in a soldier (*e*), who were taken off by a sudden death, had flow'd out from a rupture of the coronary artery. And if the foramen had nevertheless escap'd the eyes even of a skilful and attentive man, it must have been very easily discover'd by injecting air or water through the veins to the heart, and into the heart, and from the heart into the arteries, in a proper quantity, at the same time making a ligature on the arteries without the pericardium.

But if after a death that is not sudden, of which the question is not in this place, blood be found within the pericardium, you must suppose this to have distill'd gradually from the smallest vessels and pores: as, for instance, in the two observations of the celebrated Laubius (*f*); especially, since in the first of them, the surface of the heart appear'd to be, in a manner, corroded. And I would have you suppose the same thing of others, which you will find to be of the same class with these, out of the many that the very learned Senac (*g*) points out besides. But do not readily imagine, that those which he takes notice of among the rest, as being taken after a sudden death, could have been made without a foregoing corrosion or rupture of some large or middling-siz'd vessel or repository of blood; for instance, as he expressly relates, in two of the aorta, or of one of the pulmonary veins. However, the rupture most frequently happens in the aorta, when it happens in the arteries; and in the vena cava, when it happens in the veins: in the former vessel generally for those reasons, on account of which I have already assert-
(*b*) aneurisms to happen in that, rather than in the pulmonary artery; and in the vena cava, for those reasons that I shall immediately hint at. For why this happens sometimes in the heart, we shall see in the next letter.

27. Although all the blood must, of course, pass through the vena cava, as it passes through the pulmonary vein; yet there are many things which may render its passage more difficult through the former than through the latter. In the first place, the opposite and almost adverse channels of the superior and inferior cava, so that to the difficulty of the ascent on one hand, is added, on the other, the weight and impetus of the blood rushing from above downwards. In the second place, the crude and thick juices, not yet mix'd with the blood, with which the effete blood of the cava is loaded. And, finally, the obstructions which, by the force of diseases, or passions of the mind, or from any other cause whatever, may be thrown in great numbers in the way of the speedy motion of the blood, through the vena cava; inasmuch as they may exist, not only in the right cavities of the heart, but in the pulmonary artery also, and the lungs, the pulmonary vein itself, the left cavities of the heart, and the great artery. On the other hand, the trunk, or if you choose rather to call it so, the sac, of the pulmonary vein is simple, and receives the blood, when driven thither by the agitation of the

(*d*) *Commerc. Litter. A. 1732. Hebd. 41.*

n. 4

(*e*) *Aët. N. C. Tom. 5. Obs. 37.*

(*f*) *Eph. N. C. Cent. 9. Obs. 15. & Aët. eorund. Tom. 2. Obs. 107.*

(*g*) *Traité du Cœur, l. 4. ch. 5. n. 3.*

(*b*) *Epiit. 18. n. 24.*

lungs, and that in a vivid, comminuted, and mix'd state; nor can it, of itself, have any other obstacles to oppose its motion, besides those which, after the lungs, I have said may be common also to the blood, that is about to flow through the vena cava.

And this being the state of the matter, and examples of dilatation of the pulmonary vein, at the same time, not being wanting, nor even examples of its rupture (*i*); for to put that out of the question, which is related from Parey (*k*), "the pulmonary vein has been sometimes found" by Bellini, in those who have died suddenly, "to be pull'd asunder from the left auricle (*l*)," which Francis du Queye also saw at Montpelier (*m*); both the dilatation and the rupture will happen so much the more easily in the vena cava, in proportion to the number of causes that I have shown to exist, by which the blood may be retarded therein, and consequently accumulated; and being accumulated, may weaken and draw asunder the fibres of its coats; from whence, by the quantity of blood that is urg'd on, the vein may be first dilated into a varix; and after that, by reason of the extenuation of the coats, which is the consequence of dilatation, or even on account of the erosion, which generally succeeds to the distraction, may be ruptur'd. But the varices of the cava, unless they are very considerable indeed, are less obvious to the eyes of the dissector than the aneurisms of the aorta; for the veins collapse, by reason of the thinness of their coats, when the blood is taken out of them; which happens when the cava is cut into, in the belly.

Wherefore, when there is any suspicion of disorders in the cava, the dissection ought to be begun from the thorax: or if the blood, by reason of the body having been previously examin'd by others, and the viscera of the belly being taken out, has happen'd to be discharg'd, care must then be taken to inject a sufficient quantity of air or water, in order to show you what is the full breadth of the cava: and that in particular, when you have observ'd the right cavities of the heart to be affected with too great a dilatation, or contraction, or even the left: for hence it also happens, as was said just now, that the motion of the blood being retarded, the cava may be dilated; as is shown in the first of the histories of Vieussens, that are given in the sixteenth chapter of his treatise on the structure of the heart.

28. But whether Aretæus (*n*) hinted at this disorder, or any other of the vein, when he wrote "that *νέσματα* arise in this vein, when the blood bursting forth copiously, very soon destroys life," I omit to enquire; not only on account of the various lesions in that part; as Peter Petit (*o*) would have it, "if a ruptur'd vein pour out its blood;" but in particular, on account of the very extensive signification of that word *νέσματα*, which is thus explain'd according to Galen, in the Exegesis, "old disorders from a flux of humours." This is more certain, that Aretæus speaks of the rupture of this vein, and first in the thorax; as those things which he immediately adds, demonstrate: altho' the passage does not appear by which he carries the blood from that when ruptur'd, into the lungs, and the aspera arteria, from whence it may

(*i*) Epist. 24. n. 36.

(*k*) Ibid.

(*l*) De Morb. Pect.

Vol. I.

(*m*) Disput. de Syncope, c. 3. Propos. 2.

(*n*) De caus. & sign. morb. Acut. l. 2. c. 8.

(*o*) Comment. ad hunc loc.

be discharg'd. But the rupture of the cava, which was conjectur'd by Aretæus, anatomy at length has set before our eyes. For to omit the examples of this vein being ruptur'd in the belly, to which I am uncertain whether the case that Donatus (*p*) points out in Amatus Lusitanus, in whose writings I have not yet found it, refers; Laurentius (*q*), Hacquinettus (*r*), Puerarius (*s*), Lancisi (*t*), and others, have seen it in the thorax, and even within the pericardium. But all of them, except the second, whose observation is very lame and imperfect, as far as Bartholin has related it, found it to be join'd together with other disorders in the neighbouring parts; the first, with the dilatation of the aorta, and the ventricles of the heart; the fourth, with the dilatation of the aorta only; the third, with a kind of membranous and fleshy body, which was "the tomentum, as it were, of the varicose veins," being a little less than the heart, and connected to its auricles, of which body you will read these last, and other circumstances, in this section of the Sepulchretum (*u*); in which that history, with some of those just pointed out, is related somewhat more clearly than it had been describ'd in the words of Puerarius, in the eighth section (*x*). For I confess that I was less able to learn, in that place, in what manner I should understand these passages, "the vena cava being ruptur'd, and the blood being effus'd into the pericardium, and the right ventricle of the heart," which in the observation of Laurentius, who was unacquainted with the circulation of the blood, is said to have happen'd on account of "the mouth of the vena cava being ruptur'd, and all those tricuspidated membranes being lacerated," by which "a mortal effusion of blood was made into the sinus" of the heart also, on the right side: which, to speak the truth, as he takes notice of in the ventricles only, and that in a very great quantity, and not only does not mention the pericardium, but even does not hint at it; I suspect, but am not sufficiently clear, whether the rupture of the vena cava happen'd on the internal surface only. But without doubt the ventricles of the heart, by some unlucky fate or other, often create a great deal of trouble in understanding the descriptions of ruptures of the vein. For turn to Poterius also (*y*), who proposes as the cause of a sudden death, which he relates, "the rupture of a vein in the ventricle of the heart;" but what vein he means, or where it lies, declare to me if you can. The same author has written, that in some asthmatic persons, "the vena arteriosa has been ruptur'd in the left ventricle of the heart" (*z*); a vessel, which you know, is on the outside of the ventricles, and belongs to the right side, not to the left. Without doubt it is much to be wish'd, as I believe was done in the Strasburg dissertation, which I have not yet seen, except in review (*a*), and which gives an account of the rupture of the dilated sac of the vena cava; it is to be wish'd, I say, that they who shall light on ruptures of the vena cava hereafter, especially when they are quite uncomplicated with other disorders, may take pattern from Lancisi, in his accuracy and perspicuity; not only in setting down all the symptoms

(*p*) De Med. Hist. Mir. l. 4. c. 9.

(*q*) Hist. Anat. hum. corp. l. 9. qu. 18.

(*r*) Eph. N. C. Dec. 1. A. 1. Obs. 101.

(*s*) Ad Burnet. Theor. Med. l. 3. S. 58. in fin.

(*t*) De Subit. Mort. Obs. Phys. Anat. 5.

(*u*) Obs. 1. §. 1.

(*x*) Obs. 30.

(*y*) Insign. Curat. & Obs. Cent. 3. c. 60.

(*z*) Ibid. c. 22.

(*a*) Commerc. Litter. A. 1731. Specim. 47. that

that had preceded death, but also in describing the appearances that offer'd themselves in dissection. And I heartily wish that the rupture of another considerable vein had been unattended with other disorders, which, as it happen'd within the thorax, and was the cause of sudden death, ought by no means to be pass'd over in this place: the observation is very rare, and was communicated to me by that very learned physician, and familiar friend of mine, Heraclito Manfredi, in the year 1718.

29. A woman who had been suppos'd for a long time to be, and really was, consumptive, was found dead suddenly. The left cavity of the thorax shew'd the interior part of that lobe of the lungs to be diseas'd, inasmuch as it contain'd three or four tubercles, full of pus. In the right cavity, however, the lungs were found indeed, but there was, at the same time, coagulated blood in that cavity, to the quantity of four pounds. It had been effus'd from the trunk of the vena sine pari; which, although it had collaps'd from that effusion, yet, by reason of the vast distension, had retain'd so much of its breadth, that it might be well compar'd with the vena cava. This dilatation extended itself to about the length of a span. And about the middle of that length, a foramen lay open, in the form of an ellipsis. And through this foramen the blood had been extravasated.

30. Now let us return from the varices of the veins, to the aneurism of the great artery, but not to those that are ruptur'd; for of these we have seen enough already: but such, nevertheless, as are causes of sudden death. Of which take these three instances that have been observ'd by me.

31. The mother of a family, who was two-and-forty years of age, had liv'd long in a state of infirm health, and had long been subject to a kind of paroxysm, which appear'd in the following manner: on using pretty quick exercise of body, a kind of violent uneasiness came on, within the upper part of the thorax, on the left side, join'd with a difficulty of breathing, and a stupor of the left arm: all which symptoms soon remitted when these motions ceas'd. This woman then, having set out about the middle of October, in the year 1707, from Venice, to go up the continent in a wheel-carriage, and being cheerful in her mind, behold the same paroxysm return'd: with which being seiz'd, and saying that she should die, she actually died on the spot.

The body, being brought back into the city, was examin'd by me on the following day: the face of it was somewhat livid; the other parts appear'd to be quite of a good colour and habit; but the upper parts were somewhat lank and wrinkled. And as, on account of those things already related, I had a suspicion of an aneurism at the curvature of the aorta, the dissection was begun from the thorax. In this cavity was contain'd a serum, of itself bloody, and in equal quantity on both sides, and not inconsiderable; for it had been observ'd that no blood had fall'n down thither, in making the incision of the thorax. The lungs were found, except that being cut into, as I saw afterwards, they abounded with too great a quantity of frothy serum. The heart was rather large, very hard, and very strong. The aorta was not a little dilated at the curvature; but in other parts of the trunk, and the larger branches, of a proper width. But internally, wherever you cut into it, it was here and there unequal, and not without compleat bony scales, of a small size; not to mention frequent marks of ossification being begun. And

seeing this, I open'd the whole trunk, and the larger branches: and in this trunk, from the very origin behind the femilunar valves, which were in some places hard, I observ'd the disorders that have been describ'd, together with the beginnings of future bone, quite to the iliac arteries. Yet through these, and others that are even higher, and in particular the left subclavian, they were not propagated, if you except a part of that other artery, which gives origin to the carotid and subclavian on the right side. Carrying our eyes back from hence to the heart, and to the other vessels that are annex'd to it, we saw no kind of disorder any where, except that the trunk of the pulmonary vein seem'd to be somewhat larger than it naturally is. In this, and in the adjoining ventricle, was a small quantity of blood, which, like the blood in all other parts of the body, was black, and altogether fluid. But in the trunk of the pulmonary artery was no small quantity of blood; notwithstanding in the right ventricle, and its auricle, there was none; without doubt, because it had flow'd down through the vena cava, which had been previously cut into a little below the liver.

And in examining the viscera of the belly, we made the following observations. The small intestines were mostly somewhat red, and a little livid. The stomach was in a manner double, by reason of the antrum pylori being in some measure divided from the other part, by a kind of constriction; but in other respects sound. The liver was extended very far to the left, and on the right edge of it; and on the lobe which was continu'd from that edge, it was of a more saturated colour for some space, both within and without, and rather hard. The pancreas was also very hard, and on the side which lay near the spleen, of a red and blackish colour, from the blood that stagnated in it. But the spleen was lax; so that it could easily be broken down with the fingers. The testes were contracted. The osculum uteri was dilated, and subsiding: and the upper part of its fundus was ting'd, externally, of the same colour with that which I said the small intestines were ting'd with; and not without a disagreeable smell. And there was in the pelvis of the abdomen a serum of the same kind with that in the thorax, but in small quantity. The other parts had nothing worthy of observation. The head I did not touch, for it was already late at night, and the woman died while she was speaking, as I said before.

32. Although you will read, in this section of the Sepulchretum, the thirty-fifth observation, which has this title prefix'd to it, "Sudden death in a man in whom the stomach seem'd to be drawn together, as it were, with a bandage;" yet if the appearance, as I suppose, was like that which I have just now describ'd, it ought to be accounted for from the original formation of the part, rather than from any adventitious disease; nor ought by any means to be compar'd with those firm coarctations of the small intestines, which have sometimes occur'd in a volvulus, and still less be look'd upon as the cause of a sudden and unexpected death. Without doubt, that woman, in whom I have already (*b*) describ'd to you a stomach of the same kind, was gradually carried off, and by a slow disease: nor have others died suddenly, in whom I shall perhaps describe the same circumstance in other places (*c*).

(*b*) Epist. 16. n. 38.

(*c*) Epist. 30. n. 8. & Epist. 36. n. 2.

But here we have causes enough in the diseases of the artery. In the first place, the inequality of the internal surface renders the motion of the blood less easy. And, secondly, the bony scales in the coats, and the frequent beginning ossifications that were seen up and down, make the artery less fit to yield outwardly to the impulse of the blood, and admit it; and less fit, likewise, promptly to restore itself soon after by contracting, and thus push forward the fluids. Finally, the dilatation of the curvature being added to these, help'd forwards their effects; and that, not only by delaying the blood's motion, but also by propelling it with less force than usual, as I have already explain'd, with the other circumstances, on more occasions than one; so that there is no necessity of repeating these explanations at large.

Taking these effects for granted, then, if from any cause whatever, a quicken'd motion of the body, and, consequently, a quicken'd motion of the blood, is brought on; you see very plainly, that the aorta, which was scarcely equal to that office before, must be now still more unequal to the task of dispatching on the blood with greater quickness. In the mean while, therefore, a more plentiful quantity of blood, that has been brought together by the veins, will be heap'd up; and stagnating in the aorta itself, in the heart, in the vessels of the lungs, and the vena cava, will not only be able to bring on those symptoms that the woman had when living; the violent uneasiness, the difficulty of breathing, the numbness of the arm; or what were observ'd in the body after death; that is, some dilatation of the trunk of the pulmonary vein, and the great effusion of serum into the bronchia and the cavities of the thorax; will not only, I say, be able to produce these effects, but even more in number, and more violent ones, according to the disposition of the parts. And as all those disorders of the aorta were increas'd, gradually indeed, but more and more every day; it is not to be wonder'd at, if they should at length proceed so far, the quantity and turgescency of the blood being, perhaps, at the same time increas'd, or at least the motion of it being quicken'd by the motion of the carriage, which was unusual to a Venetian woman, that the blood stagnating, could no longer be propell'd.

But if you are not satisfied with all these causes, one of which only, that is, the bony scales in the aorta, gave satisfaction to the very ingenious man with whom I dissected that woman, that is, to Santorini, as I shall shew in the latter end of this letter (*d*); or if you are not satisfied with them, because we did not find the aorta, and the left ventricle of the heart, fill'd with stagnating blood; or because you think that you can better conceive of that numbness in the arm from supposing some convulsion with which the meninges were contracted about their origins, than from supposing the distraction of the distended aorta to have been propagated to the left subclavian, and to the nerves that lie near it; I am so far from replying any thing to your objections, that I shall rather advise you, if you choose to add a convulsion to the other causes, to allow of it principally in the heart. Indeed, this viscus must, without doubt, have been very strong naturally, when compar'd with the aorta; and for that reason, according to the dogma of Lancisi (*e*), must have weaken'd and overcome it: but tell me, I beg of you, why, after la-

(*d*) N. 36, 37.(*e*) De Mot. Cord. Propof. 38.

bouring so long in supplying the place of those very powers of the aorta which itself had destroy'd, we not only found it very strong, but very hard also? Read over again what I wrote of a certain man in the former letter (*f*). And a convulsion of the viscera arises much more easily in women, particularly in valetudinarian women; so that we may add this to the number of other causes both of the paroxysms and death; yet so as not to forget those things that manifestly occur in the viscera and the principal vessels; nor yet to imagine that this is to be added to the others, as is the custom with many, except when there are marks of it also in the living body, or in the body after death. And whether this should be done in the old man whose history I shall immediately relate, you yourself will judge.

33. This old man was, to appearance, about sixty years of age, and had three months before been in this hospital, complaining of a difficulty of breathing, and spitting up an ill condition'd matter. Having been in the country lately, about the beginning of March, in the year 1742, and having been expos'd to a cold wind, upon his return home again, he was seiz'd in the night with a very great difficulty of breathing. Wherefore, being brought into the same hospital again, in the morning, and sitting a little time by the fire-side, while they were warming his bed, he had scarcely laid himself down therein, but he instantly died. The students begg'd of me, on the following day, that I would enquire into the cause of so sudden and unexpected a death. And having consented, I order'd the cranium to be saw'd round in the mean while, in order to be ready against I came.

As I look'd upon the body, which was of a good habit, no tumour discovering itself any where, except that the face was somewhat swell'd and reddish; and the blood being look'd upon at the same time, which had come from within the cranium as it was cut through, almost in the quantity of a pound; although I did not deny but it might happen, that the cause of death should lie hid within the cranium, yet I shew'd, that it seem'd to me, we should rather enquire after it in the thorax, as it was certain that this man had labour'd under a difficulty of breathing; but whether he had labour'd under any disorder of the head, did not appear: in which part although a great quantity of blood generally stagnates, in those who are suffocated from a disorder of the thorax, as is perceiv'd from the face of these persons being livid and swell'd; yet the chief cause of death is not for that reason suppos'd to be on the outside of the thorax.

The thorax, therefore, being immediately cut into, and the sternum being taken away, the lungs appear'd to be so turgid as to fill up the whole cavities: they were nevertheless soft, of a white mix'd with a cineritious colour, and light, as we afterwards perceiv'd, by taking them out of the thorax together with the other parts. For the right lobe was previously to be loosen'd from the pleura, to which it adher'd closely, especially on its upper, and even on its posterior, surface. There was, in both cavities of the thorax, a considerable quantity of water, not turbid, but of the colour of urine; which kind of water, also, was found in the pericardium in somewhat larger quantity than it is generally. In the right ventricle of the heart I found a very

black and almost fluid blood, as I did in some other places here and there; so that only some grumous coagula appear'd, which were not very firm, together with some slight and small beginnings of polypous concretions. In that ventricle, and the adjoining auricle, I could meet with nothing that was preternatural; if you except the valves that lie at the beginning of the pulmonary artery, which seem'd to be somewhat thicker than they naturally are. But, although the left auricle, and the trunk of the pulmonary vein that lies near it, were in their natural state, the ventricle adjoining to them, nevertheless, although of its usual thickness in the parietes, seem'd to be wider than natural, and the mitral valves to be hard and thick; and all the femilunar valves had their edges hard, white, and, what is more than all the rest, become so much thicken'd as to equal a line and a half of the inch of Bologna (g) in thickness.

Moreover, the trunk of the great artery was much dilated from those valves quite to the upper vessels; and beyond these was still dilated, although in a less degree; the parietes of it being thicken'd, and grown much harder besides, from the heart quite to that part; and the internal surface being here and there unequal, and especially where there was a more considerable dilatation; nor was it without white and yellowish beginnings of future ossifications, in great number.

After this, I examin'd the lungs very closely, but could make no farther discoveries than I had done before, except that there was one part in which they seem'd to be a little hard: this, however, when cut into, shew'd a natural structure, which contain'd a white and frothy humour, but not any different humour, or in any greater quantity, than you might press out from the other parts of them; and from every part a small quantity only was press'd out. Finally, the upper part of the cranium being taken away, (for we did not dissect the belly) and the dura mater being soon after cut through, the falciform process of which seem'd to be very thick and hard, there was nothing found worthy of remark within the cerebrum, or cerebellum, the substance whereof was firm, except that there was no very small quantity of water in the lateral ventricles, similar to that which is describ'd in the thorax, and the plexus choroides were somewhat discolour'd; so as to make it evident that the blood, which had flow'd down from the cranium, when cut through, had proceeded from the vessels of the meninges, which were injur'd by the saw, mix'd together, perhaps, with water which was within them.

34. What the internal inequality of the aorta, what the hardness of its coats, what the dilatation, in fine, may contribute, by way of impediment to the motion of the blood, has been sufficiently taken notice of in the remarks that have been subjoin'd to the foregoing history. To these, which were in the old man also, add some dilatation of the left ventricle of the heart; add the thickness of the sigmoid and mitral valves, and their hardness; add, in particular, the borders of the femilunar valves being so much thicker and harder than in their natural state, which is a circumstance that disturbs the motion of the heart and the blood, if any thing else does, while they

(g) Vid. apud Valsalvam de Aure Tab. 9. ad *.

either oppose themselves to the blood that is about to go out from the heart, and break the force of the motion receiv'd from the heart, or do not sufficiently, by reason of their not unfolding themselves so speedily as usual, prevent the blood flowing back in the contraction of the artery; and you certainly will not want more circumstances to make you conceive how it happen'd that the motion of the blood through the aorta and the left ventricle, being retarded, a difficulty of breathing was brought on by the blood being retain'd in the lungs; or how it at length came about that these disorders being encreas'd every day, the whole constitution was affected to such a degree, that the blood, especially when augmented in its quantity, by that addition of moisture, which, if it had not been obstructed by a cold wind, would have pass'd off by the invisible foramina of the skin; that the blood, I say, could no longer be circulated.

Nor would I have you be much surpriz'd, that in this, and in the former observation, we did not find the blood accumulated in those parts, in which I have said it was retarded. For nothing happens more easily, while the bodies are turn'd about on every side, and while they are carried from one place to another, and particularly up stairs, where, sometimes their heads, and sometimes their feet, are turn'd downwards, than that the blood, especially when fluid, as it was in these bodies, in great measure changes its place: and the same must of course happen when the viscera are taken out; and indeed the blood must then flow down through the vessels that are already cut into, and afterwards through those that are open'd in the neighbouring parts. But if you should be willing, nevertheless, to attribute something to that water also, which was seen in the ventricles of the brain, and to suppose any circumstance from whence the nerves that go to the heart and the lungs have encreas'd the causes of sudden death, and so by this means also explain that tumour of the putrescent lungs, by supposing that they were not able to thrust out their air; I shall not greatly oppose your opinion. But shall you imagine that there was something paralytic, or rather something convulsive, in that man whom I shall immediately describe to you?

35. A man of some family and credit (who was not yet sixty years of age, having been formerly affected with a lues venerea, so that the rheumatic pains with which he was much troubled, were also, for the most part, ascrib'd to that cause, after having got rid of these for fourteen or fifteen years, by means of sweats being excited, with the usual decoctions of woods, and the dry bain) grew fat, yet not immoderately, and particularly in his belly and thorax, but not so in his lower limbs. His intimate acquaintance had observ'd him to be subject, at intervals, to a cough, with which he expected nothing; and in like manner, to a certain difficulty of breathing, especially after eating. However, at a time that he was very robust, and seem'd to every body to be in excellent health, except that he had said, not long before to a friend, that his head was confus'd; having supp'd very sparingly, he was first seiz'd with a slight cough, which soon after encreas'd so much, that being already foaming at his mouth, he order'd a physician to be call'd. The physician, however, found him dead, the foam discovering itself at his mouth and his nostrils, from whence they said that something of a bloody humour also had afterwards proceeded. The death of this man hap-

happen'd in the beginning of May, in the year 1729, in which month it is hinted in this letter (*b*), and in others, and particularly in the third (*i*) and the fourth (*k*), that many had died suddenly in the city, and in the country round about it: and if you compare the dissections of these persons one with another, you will readily conceive, that notwithstanding all of them were taken off by an unexpected death, yet that different persons were taken off from different causes, as this man, whose thorax and internal parts of the head I examin'd, together with the primary professors, my colleagues, about thirty hours after death, and made these observations.

The thorax, which was on its sides of a livid and reddish colour, had a considerable quantity of fat on its external part; and when it was open'd, we also found a considerable quantity in the mediastinum. The lungs were internally and externally brown, and yet soft, both lobes being connected with the pleura anteriorly, but the left all round; and internally, they were found to be moist, but not to any very considerable degree; so that they were neither externally heavy, nor did they discharge a froth, or any thing else, from the aspera arteria.

In both the cavities of the thorax and in the pericardium was a much greater quantity of moisture than there usually is; which was of itself of a bloody colour, and not so from the blood that had fall'n down in the dissection. The heart and its auricles not only contain'd nothing polypous, no appearance of which kind I saw any where in this body, but even contain'd scarcely any blood. As in this subject I could find nothing worthy of remark, in the valves, or in the great vessels, each of which I order'd to be laid open, except in the aorta; I at length fix'd my attention to this vessel. For, in the first place, from the heart quite to the curvature it seem'd to be dilated. It was also mark'd, here and there, on the internal surface, with white spots. And it was, besides, on the same surface, universally unequal in some measure. And what seem'd to me the most remarkable of all, of a black colour mix'd with red, as if it had been affected with a kind of inflammation. These white spots did not appear beyond the bounds of the dilated artery. But those other affections were produc'd through the curvature, and where the artery goes down in the course of the vertebræ; yet not so much as in the dilated tract. So also, although they were produc'd through that branch, which sends off the subclavian and the carotid on the right side, yet the greater distance this artery obtain'd from the beginning of it, the less did these diseas'd appearances discover themselves. Having begun the dissection of the head immediately (the face being then livid) when the cranium was open'd, nothing at all flow'd out. The vessels of the pia mater were turgid with blood; and in the lateral ventricles we observ'd a water which was somewhat bloody, though not so to any considerable degree. However, the colour of the plexus choroides, and all the parts of the ventricles, or those in the medulla oblongata, the cerebrum, or the cerebellum, which were rather hard than lax, that are wont to be enquir'd into by dissection, were all in a natural state. The abdomen was not open'd.

(*b*) n. 17.(*i*) n. 11. & 26.(*k*) n. 21.

36. If you should say that this man was suffocated by a convulsive cough, I shall be so far from contesting it with you, as I know that the invisible cause thereof might lie hid in some nervous ganglion, that I will put you in mind over and above of the examples which are in Lancisi (*l*), of a convulsive cough that has suddenly carried men off. Yet I do not, for this reason, think that those appearances which I observ'd in the great artery, are entirely to be overlook'd by you. For this man had, indeed, been subject to a cough; but one which was not wont to attack him with such violence, that it could, as in the examples of Lancisi, be foreseen and foretold that he would some time or other be suffocated thereby.

We must consider, therefore, what assistance the inflammation of the aorta may lend, to the bringing on of a sudden death; whether join'd with a cough and convulsion, or not join'd therewith. Yet we must previously consider, what things have been observ'd by others, when there was an inflammation of the aorta; lest our speculations should, perhaps, lead us so far as not to agree with observation and experience. But when you have examin'd the passages of Aretæus (*m*), in which this disease is treated of, tho' there should be no other cause of doubt, yet this at least will occur; I mean, whether those signs which he produces, are confirm'd from the inspection of bodies after death. But I do not at present recollect, that any one has made this enquiry, from the time of Aretæus quite to our times. I only remember that Boerhaave (*n*) says of an ox, who had run away with a most violent impetus, that he had seen this disorder to such a degree in this creature, that the "aorta" was "extremely black." If you should see other things said by him, or others, on this subject, I would have you put me in mind of them: and when I have read them, I will either reject my present speculations, or if it is in my power to confirm them I will write them to you.

In the mean while, I will not omit to add some other certain instances, that have been observ'd, by my friends, in the great artery, or in any other within the thorax, from whence either a sudden, or, at least, a speedy death, contrary to expectation, has been brought on: and first, what I promis'd above (*o*), that is to say, how much the celebrated Santorini believ'd, that the bony scales in the aorta related thereto; which, in consequence of his own observations, he did not doubt were even of themselves sufficient to kill a man suddenly. For he related to me, and the rest of his friends, six or seven instances of persons who died in this manner, in whose bodies he could find nothing, besides these little bones, from whence to account for their sudden death; and amongst them, the most recent was of that man of whom I have made mention in another place (*p*), on account of the appendicula vermiciformis being deficient. The narration was as follows:

37. A Venetian taylor, who was given to hard drinking, and in regard to whom it was not certain that he had made complaint of any thing in respect to his health; except formerly of a hernia, and that he had very lately said to somebody, that he seem'd not to be very well; sitting by the fire, on the very same day that he had said this, at the house of one of his acquaintance, and

(*l*) De Subit. Mort. l. 1. c. 18. n. 3.

(*m*) De caus. & sign. morb. Acut. l. 2. c. 8.
& de eorund. curat. l. 2. c. 7.

(*n*) Prælect. ad Instit. §. 827.

(*o*) n. 32.

(*p*) Epist. Anat. 14. n. 62,

having eaten two little fish call'd gurnets, and drank some new wine; for it was now almost the middle of October, in the year 1708; not long after, as he still sat in the same place, he cry'd out, Oh! oh! and no more; for he was instantly dead.

The thorax being open'd on the day following, the lungs, indeed, were not very found; and in the pericardium was found some quantity of water. But as it was evident that the man could not have died in this manner from either of those causes; and as the heart, and the other viscera, had no appearances worthy of observation; the great artery was open'd, from the curvature quite to the loins; and show'd, internally, frequent bony scales; which were seen in both of the carotids also, but not farther than to a moderate height.

However, the blood was fluid, the liver very natural and fine in its appearance, as the other viscera also were, except that the stomach, as generally happens in drinkers, was very large; and that part of the intestines which I have said was without the appendicula vermiformis, was in the hernial sac, together with a portion of the annex'd mesentery; and the orifice of the sac was three or four inches broad.

38. After he had accurately related these things, and after we had, as is usual among friends, said some one thing, and some another, in regard to the sudden death of this kind he had given us the history of, and even those causes which escape the eyes of anatomists, whether they are on the inside or on the outside of the brain, not being pass'd over without notice; I remember I ask'd, with a kind of smile, whether they also plac'd, in the number of those causes, that which Piccolhominus has hinted at (q), where he says, "it is his opinion, that the obstruction of the little nerve which goes to the heart, suddenly brought on, is the cause for which some persons go suddenly and unexpectedly out of this world?" At least, said I, you are not ignorant, that even when the nerves, which are about to go to the heart, are cut through in the neck, the animal does not immediately die; so that although an obstruction of the nerve going to the heart may, possibly, when join'd with other causes, bring on a sudden death, yet it cannot of itself have that effect, unless all of them should be obstructed at the same time: for by this means I understand the justness of the opinion of Herophylus; who, as we have it in Cœlius Aurelianus (r), taught, "that sudden death, when it proceeded from no very evident cause, was brought on by a paralysis of the heart." Then Santorini related the other six examples, which were similar to the one already given; and said, that he should very much wonder, if, in all these cases, some invisible cause or other had not been at hand, and had join'd itself with a manifest one; that is, with the bony scales in the aorta: and show'd, that in regard to himself, he had not the least doubt, but sudden death had proceeded from these alone; especially at the time when the blood was to be push'd forwards, by an artery affected with a disorder of this kind, while it was just increas'd in its quantity, by the recent chyle being added to it; or turgid, from the quality of this chyle; or, finally, while it was expanded by heat; which circumstances, without doubt,

(q) l. 5. Anat. Prælect. 6. & l. 4. Prælect. 4.

(r) Morb. Chron. l. 2. c. 1.

had all of them coincided in the taylor, and some of them in the others. But why an artery thus diseas'd was, at that time, unequal to the task of propelling the blood, has been already explain'd by me; and that even in this letter (s).

39. But mention being made of my most intimate and esteem'd friend calls to my mind the remembrance of another, Sebastian Anthony Trombelli, a most excellent surgeon and physician, at Bologna; whose sudden and unexpected kind of death happens to be the more lamentable to me, for this reason also, that I had a singular regard for his brother John Jerom, the abbot (a most learned divine, as his writings testify) and still have a singular regard for him. You cannot be ignorant how sudden, violent, and short, the last disorder of the former of these gentlemen was; and how many, and various, were the opinions of learned men upon it. If you ask what I myself thought, before I heard any thing of these, I will tell you in a few words, that there is no opinion to be preferr'd; but that you must accurately enquire, and consider, over and over again, whether it is probable that this disorder has any relation to what I just now premis'd (t).

For as soon as ever I had read over the letters of Joseph M. Verlicchi, (whose diligence, assiduity, and continual study, in medical discipline, was well known to me, from the very time that he attended my lectures here) in which he not only gave a full account of all the appearances that he had observ'd in the body, which he dissected after death, but also of what had been observ'd in the patient, whom he had attended; the case seem'd to me to be, in some measure, comparable with that which was describ'd by a very learned man, whose too early death I have likewise lamented, Anthony Leprotti (u): and this I wrote back to Verlicchi; and found by other letters, which he sent to me afterwards, wherein every circumstance was clearly explain'd, that his opinion agreed exactly with mine. That is to say, as in the man of whom Leprotti gives the relation; it was found by him, and the celebrated Janus Plancus, that blood being extravasated from the bronchial artery, which was ruptur'd, under the membranes, and through the interstices of the fibres, by which the aspera arteria, the aorta, and the cesophagus, and the other neighbouring parts, are collected together, had made a passage for itself, to a considerable extent, all round; and being coagulated, had rais'd these membranes into the form of a tumour: so in Trombelli blood being extravasated from some other artery, that was ruptur'd betwixt the opposite laminæ, that is of the anterior part of the mediastinum, seems to have open'd a passage for itself through the cellular substance of that part; and to have coagulated in such a quantity in that place, in particular, where it was carried by its own weight, that, near the diaphragm, the solid thickness of the mediastinum was almost equal to three inches. And by this means, all the circumstances which had preceded, and those that did not attend, as well as the appearances which were found in the body, seem to be very easy to be understood.

And although, as I have promis'd to be brief, I must not consider every one of these circumstances separately, yet I will say, at least, that those cor-

(s) n. 32.

(t) n. 36.

(u) Comment. de Bonon. Sc. Acad. Tom. 1. in Opuscul.

pufcles which had before corroded the ſkin, in the form of a very large and troubleſome herpes, did, when this eruption was driven back, corrode that artery; and that the blood which iſſu'd from the artery, while it drew aſunder the laminæ of the mediſtinum in a ſpeedy and violent manner, had been the cauſe of that very ſevere pain in the ſternum, which the patient deſcrib'd to be of ſuch a kind that it ſeem'd to be tearing him aſunder; but that it ought not to have produc'd the other marks of an inflam'd mediſtinum, which were abſent; and, at length, that ſuch a great quantity of blood as was collected into grumous concretions between the two laminæ of this part, eſpecially in ſo ſhort a time, could not be accounted for but from ſome artery being pierc'd through.

However, moſt of theſe things the letters of Verlicchi explain'd; and not only the others, which alſo answer'd the objection of thoſe who, as Leprotti's patient had dragg'd on his life for ſome days, enquir'd into the reaſon why Trombelli was taken off within nineteen hours. For beſides that the heart was preſs'd upon by ſo very great a diſtenſion of the lower part of the mediſtinum, a tubercle had been form'd before this diſeaſe, at a ſmall diſtance above the heart, in the coats of the great artery, of the bigneſs of a pretty large nut, full of a humour verging to the colour of the yolk of an egg; which tubercle being protuberant to a conſiderable degree within the cavity of the artery, the blood was not able any longer to overcome that obſtacle as before, the powers of the heart being weaken'd, as appear'd from the pulſe being become ſmall and weak; but being retarded in its motion more and more, oppreſs'd the heart and the lungs themſelves: for which reaſon the force of the diſeaſe could no longer be ſupported.

40. You have heard, then, which way my opinion of this diſeaſe formerly inclin'd; whereto, however, you will pay no greater reſpect than accurately to conſider of it. And if you aſk what marks of the exiſtence of this tubercle there had been in the living body, and whether I have ever read any obſervations, beſides that I juſt now commended, in which there are circumſtances, in ſome meaſure at leaſt, ſimilar to thoſe that were found in Trombelli; I will ſatisfy you as far as it is in my power. And, firſt, I have heard that he had been formerly oppreſs'd with very heavy paſſions of the mind, and later than that with ſome ſlight palpitation of the heart; and that he alſo began to be attack'd with ſome little faintings, ſo as to be thought hypochondriac by the phyſicians.

And as to what relates to the tubercle of the aorta, as I find from the *Aſta Eruditorum Lipſienſia* (x), that a diſſertation of the celebrated Stentzelius, entitl'd, "Of ſteatomata found in the beginning of the aorta," had been publiſh'd, which has not, that I know of, been as yet imported into this country, I would have you examine it, if it be in yours; for if it answers to its title, you will certainly find ſome things that are not altogether unlike what you enquire after (*). If I have any thing which relates to internal tubercles of the arteries, I ſhall take notice of it in the next letter. But in regard to blood being extravafated within the laminæ of the mediſtinum, as far as I re-

(x) A. 1731, M. Maj.

(*) Sed vid. Epist. 64, n. 14.

member at present, Riverius is the only one that has hinted any thing in respect thereto, and that in the sixtieth observation of the first century. For as to Blancard's writing something of the same kind likewise (*y*), without doubt, they are so far similar as to be quite the same, the name of Riverius only being conceal'd, and the words somewhat chang'd. If you read the whole of this observation in its original author; for it is not universally copied in this eleventh section of the Sepulchretum (*z*), nor yet in the first (*a*) of the first book; you will find that there had been a suspicion of an inflammation of the mediastinum also, among other things, in a certain patient; and that when she seem'd to have recover'd from this, she was carried off by a sudden death; and that the mediastinum was found "full of bloody serum." However, in regard to extravasations of blood from its vessels, consider'd in general, not into the great cavities of the body, but into the cellular structure, which is confin'd under membranes, the opinion of Gilbertus deserves, on the score of its antiquity, to be related. For he, as Nicolaus Florentinus wrote three hundred and fifty years ago (*b*), taught, "That the blood which "is extravasated by the vena chylis, that is, the vena cava, is not always "pour'd out into the cavity of the belly, but is retain'd beneath the fat, "which surrounds the kidneys and other parts:" and this, as it had been, perhaps, even seen by Gilbertus, is not to be so far rejected, if the rupture of the vena cava is small, as that which is subjoin'd by Gilbertus in regard to discharging from the bladder, by way of urine, this very blood that has been so retain'd. The other things that I have promis'd (*c*), you may expect very soon. Farewel.

LETTER the TWENTY-SEVENTH

Treats of Sudden Death from a Disorder of the Heart. And in the End a few Things are added upon the Subject of Gibbosity, or Incurvation, of the Spine.

1. **A**S I have written in the foregoing letter of that species of sudden death which proceeds from disorders of the blood-vessels, whether they are ruptur'd or not ruptur'd; so I am now to write of that which is the consequence of disorders in the heart, whether it be ruptur'd or not ruptur'd.

(*y*) Anat. Pract. Obs. 52:

(*z*) Obs. 20.

(*a*) Obs. 123.

(*b*) Apud Donat. de Med. Hist. Mirab.

1. 4. c. 9.

(*c*) Supra, n. 2. in fin, n. 18. in princip.
n. 26. in. fin. &c.

The first observation of a ruptur'd heart is, as far as I know, given by Harvey (*a*), who describes a nobleman to have been often seiz'd with a kind of paroxysm, particularly in the night, in which, from an "oppressive" pain of the chest, he sometimes was afraid of a swooning, and at other times of suffocation; till "the disease growing more violent, he became cachectic and "dropical, and at length, being violently oppress'd in one of the paroxysms, "he died. In this patient, by reason of the circulation of the blood being "obstructed," (whatever the obstruction was, for what it was he does not say) "from the left ventricle into the artery, the very substance of the left "ventricle itself, which seem'd to be pretty thick and strong, had been ruptur'd and perforated with a large opening, where it had discharg'd its blood; "for the foramen was sufficiently large to admit a man's finger." And this observation I was willing to copy over to you in this place, because I do not remember that it has been quoted by any writer, not even by Bonetus; unless you should, perhaps, imagine, that the words of Rolfinck, which are quoted by him, not in this eleventh section, but in the eighth (*b*), "the impetus" of the blood upon the heart "is sometimes so violent, as to break through "the septum itself; examples of which tragical case are given us by Harvey;" unless, I say, you imagine these words to relate to that observation. And notwithstanding it appear'd in the same light to him also who added the index to the three first exertations of Harvey, as he refers to the observation that I have describ'd in the following words; "the septum of the "heart ruptur'd from the blood being detain'd in it;" yet the words of the author himself, without doubt, signify quite a different thing. To this observation of Harvey I join another, which I have sufficiently spoken of in the twenty-fifth letter (*c*), from Peter de Marchettis (*d*). For although the heart was, in this case, open'd by a fistula, that reach'd at length into the left ventricle; yet, whether it be open'd from erosion, or from distension, the rupture is in fact always the same; because when the erosion has proceeded so far, that only a very thin lamella of the heart remains, it is evident this must be forc'd through, either by the weight or the force of the blood with which it is urg'd: and for this reason, even when I spoke of the aorta being ruptur'd, I pointed out various causes of the rupture; yet always call'd it rupture, nevertheless. A third observation, which the celebrated Morand (*e*) has also mention'd, you will read in Bohn, not in his *Circulus Anatomicus*, indeed, but in his book *De Renunciatione Vulnerum* (*f*), in which I at last found it by accident. And it is an instance "of a rupture of the left ventricle of the heart, near the mouth of the aorta," in a nobleman where "no signs" had preceded, and who "being of an athletic "and beautiful habit of body, had died suddenly by the side of his wife." Of which rupture you will easily suspect the last cause, being mindful of those things that are written in the preceding letter (*g*). And the very learned Bohn thought this kind of death to be such a one, "as was scarcely ever

(*a*) De Circul. Sangu. Exercit. 3.

(*b*) Obs. 11.

(*c*) n. 12.

(*d*) Obs. Med. Chir. 47.

(*e*) Mem. de l'Acad. R. des Sc. A. 1732.

(*f*) Sect. 1.

(*g*) n. 14.

“ seen by the most expert dissectors.” And indeed another very learned man, John Fantonus (*b*), has said, that it ought to be esteem’d extremely rare, when he related, from the common-place book of his father, “ that the heart of a man, who had been troubl’d with a very violent spasm, was found to be ruptur’d; and the pericardium, which was of a very considerable size, to contain a large quantity of blood;” being, at the same time, much chagrin’d that his father had made no farther remark, or at least, that he had not said from which ventricle the blood had burst forth. And this being the state of the question, I am not displeas’d that I happen’d to light on a fifth observation of the heart being ruptur’d, at Venice, in the year 1707. And after describing this to you in an accurate manner, as our order requires; for being upon another subject in the *Adversaria* (*i*), I have but just hinted at it; I shall not omit to take notice of others, which have come to my knowledge, and partly to describe them.

2. A woman of seventy-five years of age, of a manly aspect, and very fat, having been quite slender to her five-and-fortieth year, was, in the latter years of her life, become a valetudinarian; yet in such a manner, as never to complain of a pain in her head, much less of any violent indisposition that could be refer’d thereto; but she rather complain’d of other things, among which her acquaintance, though but little accusom’d to attend minutely to these lamentations of a querulous old woman, particularly mention’d a kind of swoonings, as it were, and other disorders of that kind; which she herself, as she did not know how to explain them otherwise, was us’d to signify by a word that, as I have said before, was common among the inhabitants of her city, that is, *flato*, or wind. These complaints were, in general, much exacerbated in the last six months of her life. At length having drunk, in those days, some glasses of new wine (for the middle of October was elaps’d) and having been somewhat worse therefrom, she all of a sudden said, as she happen’d to be sitting very intently at her domestic employments, that she felt something or other move up and down within her; and presently, that the house seem’d to her to totter; and soon after, being seiz’d with a very short stertor, she died.

Examining the body, on the day following, I saw a bloody humour proceeding from the mouth; the back was of a red colour mix’d with lividness; the fingers contracted, and when we endeavour’d to extend them, they resisted the extension; but this was not the case in the arms. And when, in the presence of several friends, and being assisted in the dissection by the celebrated Santorini, I began to cut through the common integuments of the body, a black and frothy blood, such as we afterwards found in most of the vessels, flow’d out. The *membrana adiposa*, which was in other places thick, was, at the pubes, so extremely thick, as to exceed four fingers breadth.

The cartilages of the chest, that join the ribs to the sternum, gave no more resistance to the knife in cutting through them, than they generally do in very young subjects; which I suppose was owing to their being preserv’d soft by the same fat wherewith the whole body abounded. The sternum being taken away, this fat appear’d in so great a quantity in the thorax, as to

(*b*) Anat. Corp. hum. Diff. 12.

(*i*) VI. Animad. 84.

cover the mediastinum on one hand; and on the other it was easy to conjecture how great a quantity there was in the belly, from this circumstance, that the diaphragm being driven up pretty high into the thorax, took away so much of the space which properly belongs to it, that it did not seem at all surprizing, to those who were present at the examination, that fat persons cannot easily lie on their backs, unless their shoulders, and the upper parts of their backs, are rais'd pretty high. The lungs were entirely sound, although they were internally black, from the blood being retain'd in them; and the left lobe, on its posterior surface, adher'd to the pleura.

The bronchia, and trunk of the aspera arteria, had nothing extravasated within them. But the pericardium contain'd so great a quantity of extravasated blood, partly grumous and partly fluid, that before it was cut into it resembled a spheroid, the diameter of which was nearly equal to a span. Yet the heart itself took up no small space within this cavity, by reason of the great quantity of fat adhering thereto, and almost universally covering it over. And while we cleans'd this fat from the blood on all sides, and even by inverting the heart, we observ'd it to be, in a certain part, more prominent, and almost black, from the blood which stagnated in it. This part was on the posterior surface of the heart, very near to the apex: and the fat in that part, when attentively examin'd, shew'd a laceration in the middle of the blackness. The left ventricle being then open'd longitudinally on the opposite surface, we found scarce any blood therein, if you except a small coagulum adhering to that part which answer'd to the lacerated fat. This coagulum being gently remov'd led us to a round foramen of the bigness of a lentil, with which the substance of the ventricle, that was in this place naturally become very thin, had been penetrated; so that it was evident the blood had come forth from the heart, first, in that place, under the fat; and had afterwards insinuated itself here and there, through the membranous cells thereof; and by distending, raising up, and forcing against them, had at length easily broken through them.

These things being found in the state I have describ'd, I observ'd other appearances in the same ventricle. For about the orifice where it receives the blood in the very substance of the heart, there was a bone of more than an inch in thickness, in the shape of half a circle, to which the mitral valves adher'd, that were in like manner become bony; except that one of them had preserv'd a great part of itself sound, so as to be able to shut up the orifice, which was contracted by those bones that were form'd nearly all round it, and protruded themselves inwards, if you added thereto the bony part of the valves; for this is that very old woman from whom I made the same description, in the fifth of the *Adversaria* (*k*). The valves of the great artery, also, were partly already bony, and partly had begun to be ossified.

And in the right ventricle, and the annex'd auricle, I observ'd nothing, except that they were entirely destitute of blood, as the left auricle nearly was also; whereas the trunk of the pulmonary artery was full of it, and that of the same kind with what we had seen in the pericardium; and the aorta, in

(*k*) *Animad.* 14.

like manner, contain'd a great quantity, which was, however, form'd into coagula, as we found by opening this vessel, from the heart quite to the iliac branches. This vessel began, about the termination of its curvature (for so far it had proceeded quite sound) to become internally rough with large bony scales; which in some places being more frequent, and in some places less so, were seen through the whole of the remaining trunk, here and there, and not without marks of an obscure kind of ulceration. And indeed we found some of the arterial branches in the belly, and particularly those that belong to the coeliac artery, already become bony.

And the belly having been open'd a little before, and being in some places even then warm (although the season was at that time rather cold) which had been also observ'd before in the thorax; and the thickness of the omentum being first taken notice of, on the account of much fat, although of a filthy hue; and soon after that of the mesentery; these appearances occur'd that seem'd worthy of remark. The spleen was turgid with frothy blood. The pancreas was hard. The gall-bladder was very much contracted, and full of calculi, to the number of fourteen; eight of which were very small, and the others pretty large: these calculi were nearly of a cubical form; and being immediately applied to the flame, took fire. The right kidney was, in a certain part of its surface, ulcerated; and in another cicatrized: and both these places, if you touch'd them, seem'd to be soft, as if from urine that was confin'd within: when they were cut asunder, they appear'd to be lax in their substance, as that of the spleen generally is, and very moist; a humour also stagnating in some places, distinctly from the other, in a kind of loculi, or cellules, as it were.

At length having open'd the cranium, we found the dura mater to be so much more closely affix'd to the sutures, and the parts about them, and particularly the sagittal and lambdoid, than it generally is, that it could not be pull'd away without laceration. On the contrary, the pia mater very easily follow'd the fingers, when applied to it to raise it up; for there was water beneath it: which was also seen in the lateral ventricles, in both of them in small quantities. The cerebrum was found, as the cerebellum was also; but the latter was very lax. The basilar artery was somewhat hard; as were also the other arterial branches that lie about the cerebrum. When all these contents were taken out of the cranium (which, as appear'd from the breadth of the sections, was not of a little thickness) on the basis of it, and also upon the hollow surface of the os frontis, those appearances came into view, which I have spoken of in the sixth of the *Adversaria* (1). That is to say, the os frontis was prominent in that part, in the form of very frequent tuberosities: and the same kind of appearances were also in the basis of the cranium, especially on the petrosal processes; but were less in these parts, at a greater distance from each other, and did not rise so high. All these tuberosities were made up of a more white substance than the bones in any other part of the cranium were; so that they seem'd to consist of a new accession, and, as it were, an effusion of bony matter. And though the surface of each of these prominences was very smooth, and shining; yet the

very great inequality, and extuberating state of them all, could not but extremely compress the brain, wherein there appear'd to be, in other respects, no kind of injury, in what part soever it corresponded with these tuberosities.

As to what remains, having, besides the kidneys and the aorta, taken out from the body the part of the heart that was nearest to this artery, and the tubes of the uterus, which were of a white colour, that I might, on the day following, examine into some things which do not relate to the disease; I was surpriz'd to find, that within the space of this night, although the weather from cold, as it was before, had become much colder, all the parts, contrary to our expectation, had contracted the most intolerable stench; and not only beyond sufferance, but beyond belief.

3. I remember that I have taken notice to you before (*m*) of the intolerable ill-smell, which arose sooner than we should suppose in the carcase of another woman, in like manner; which woman was also pretty fat. But that woman had, at least, been macerated by a disease of fifteen days continuance in the hospital; and this died suddenly; but, on the other hand, shew'd that mark of putrefaction which was not observ'd in the other; I mean, bubbles of air in the blood. What is the case then? Does the same thing that happen'd to this fat woman, happen to others also who are of a fat habit of body; I mean, that by a rupture being suddenly brought on, the blood is pour'd out into the pericardium, and that not in a very few instances neither? For if you only turn to the foregoing letter, you will find four; that is to say, an old man (*n*), and a woman (*o*), both of which I saw, and two others (*p*), whom I mention'd as having been seen by others. Does the fat which preserv'd, as I have already suppos'd, the cartilages of the ribs soft and tender, in this old woman, also preserve the fibres in the vessels and their contexture very lax, and make them give less resistance to the distraction from each other, if any considerable distension be brought on? And you will the more readily suppose a distension of this kind to have happen'd, from wine that was new and still effervescing, if you call to mind what happen'd to the Venetian taylor (*q*) after the use of it, which ought to be avoided where there are any disorders of the heart or the vessels, and what Santorini thought of his sudden death; and also call to mind what the very experienc'd Mulchenbroeck (*r*) has taught in regard to the injuries arising from "fluids being taken into the constitution in the very act of fermentation, that is, when abounding with great plenty of air which is agitated with a brisk motion, which takes up a much greater space, and unusually distends the vessels;" that is to say, in consequence of the particles of this air being expanded by the heat of the blood.

Or are we to suppose, that as much as the quantity of fat, which is collected and confin'd underneath the skin, resists the motion of the blood that is about to fill the external and smaller vessels, so much it must of course be thrown internally upon the larger vessels and receptacles; and in that part par-

(*m*) Epist. 18. n. 34.

(*n*) N. 15. (*o*) N. 17.

(*p*) N. 26.

(*q*) Epist. 26. n. 37, 38.

(*r*) Disp. de aeris præsent. in humorib. animal. c. 1. § 18. coroll. 4. & 5.

particularly where they are more lax, or in part eroded, break through their parietes? Or, finally, is erosion so much the more easily effected, as the blood abounds with a greater quantity of fat? It does not escape me, that to almost every body it seems just the reverse, not doubting but the fat corrects the eroding particles, or at least obtrudes and entangles them. For me, however, when it is in too great a quantity, whether for that very reason it cannot be good, and proper to correct acrimony; or whether by pressing upon the small vessels, and retarding the humours in them, it is the reason of their becoming acrid by stagnation; or whether it so entangle the more acrid particles, as to retain them in the constitution, which must naturally exert themselves at length, when they are more and more collected, and occasion is given; for me, I say, not to dispute upon modes and causes, it is sufficient, that erosions have been frequently observ'd in fat bodies; and that I myself have found in this woman, and in another also of a fat habit(s), to which you may certainly add a fat old man(t), the great artery internally eroded. And, indeed, the kidneys, as well as the heart, which are always beset with a greater quantity of fat than any other viscus, did not escape ulceration in this woman.

4. But I do not rank these bony tuberosities that were observ'd on the internal surface of the cranium, with that kind of exostoses which Boerhaave(u) mentions to have been seen by him and Rau after epileptic paroxysms; but rather, if I may so speak, with the class of new vegetations, such as Poupart(x) describ'd in the vertebræ of a man who was about a hundred years old, of a peculiar whiteness and smoothness, of which these of ours also were. And if both of these kinds, as his seem'd to him, and as ours seem'd to us, were form'd from an effusion of bony juice, as it were, it will be less easy to account for them, according to the late observations and opinion of a most experienc'd man; especially as in our old woman the dura mater, which holds the place of the internal periosteum, show'd no mark of injury in itself where it cover'd these tuberosities; nor did it adhere to them very closely, as it did to some other certain parts of the cranium; nor had the woman complain'd of any pain or disorder of the head at any time. And how this circumstance may be understood, and what may be deduc'd from it, it is to no purpose to repeat here, as I have already sufficiently spoken to these things in the sixth of the *Adversaria* (y).

I, therefore, return to the promis'd series of observations of the heart being ruptur'd, that have come to my knowledge. And among these, that has a title to this place which was made by that very worthy and respectable man Anthony Marisati, in this hospital, about the same time that mine was made; and related to me by him in the year 1708, at the time that he, with great diligence, perform'd the office of assistant physician there.

5. A woman who labour'd under a palpitation of the heart, having just fat up in bed where she lay, for the sake of eating her dinner, cried out, I am dying, and died almost instantly. The thorax being open'd after two or

(t) Epist. 26. n. 17.

(s) N. 15.

(u) *Prælect. ad Instit.* § 860.

(x) Hist. de l'Acad. R. des Sc. A. 1699. Obs. Anat. 1.

(y) *Animad.* 84.

three days, the pericardium was found to be distended with concremented blood. And this had been discharg'd from the left ventricle of the heart, which a kind of little ulcer, as it were, had perforated at the apex.

6. This case is pretty similar to ours; but whether it is similar to those, also, that Lancisi has observ'd, though I partly suspect the contrary, I do not, however, know for a certainty. For in his posthumous work *De Motu Cordis* (2), publish'd in the year 1728, he has really both made mention of those persons who "are carried off by a sudden death by reason of a foramen being open'd "prematurely in the heart," and has testified, not only that he had seen this "kind of death," but "even that he had frequently seen it;" which passage has escap'd the notice of a man in other respects learned, as sometimes happens. And I wish Lancisi could have finish'd this work of his; for in that case I do not doubt but we should have had both these and other observations expressly and particularly written by him. At present, however, in regard to these observations, we have nothing else to take notice of, except that he there shews his opinion to be, that among others who are liable to this kind of death, are those bodies in which he found, in an age that was yet puerile, the fibres of the heart not only "more languid, and not sufficiently cohering, "but also deficient;" as he found, particularly, "in the left ventricle, a "certain place, and, as it were, a transparent foramen, which the external "and internal membranes only prevented from being quite open." And he has justly said, "among "others: for those that are subject to internal ulcers, and in whom, as he has said, the fibres of the heart are "more languid," are also liable to this kind of death.

7. A very clear and striking instance of each of these last kinds of death is produc'd by him, who has written and collected more than any other person ever did yet on the subject of rupture in the heart; I mean, that celebrated man Morand (a). Both of these cases happen'd in the year 1730. One in a woman of princely rank, who was already pretty far advanc'd in age, and whose right ventricle of the heart was observ'd by the celebrated Lemery to be externally corroded; so that an ulcer had, by degrees, penetrated from thence quite to the cavity of the ventricle: which was for that reason empty, inasmuch as the blood was effus'd into the pericardium from that ventricle, though the left was full. The other in a nobleman whom Morand himself dissected, and found the pericardium fill'd with concremented blood, and the heart so extremely lax, that it could be pierc'd through merely by the weight of a probe; and the blood had been pour'd out from the left ventricle, through a fissure about eight lines in length, which was found in the middle of that ventricle. The other circumstances that relate to these cases, you may read in the same Morand, except the causes and signs that had preceded: which, whether because there were none worthy of remark, or rather because they are deferr'd to a future treatise, are not to be found in that memoir.

But in the observation of the ruptur'd heart, which is the last but one, as far as I know, and relates to ulceration, as both the causes and signs that had preceded were written to me by the person who made the observation, and communicated it to me in the year 1740; that is, by Laurence Mariani, for-

(2) Propos. 28.

(a) Mem. de l'Acad. R. des Sc. A. 1732.

merly a most eminent physician at the court of Placentia; so you will now have them related to you by me.

8. The subject of this observation was a man of great figure, and by degree a knight, aged sixty-five years, but of a strong-built constitution, and a good disposition of humours, except that for some years before he had labour'd under long and obstinate ulcers of the legs; which being tir'd of, he had at length heal'd up, by the use both of external and internal remedies. This gentleman being, at last, frequently subject to rheumatic pains, but so slight as not to prevent him going out from his house, which he had done even the very day before he died, was more violently seiz'd with them, on a certain day in the beginning of June, at the sternum, and in the arms, not without some convulsion of the head. And such remedies having been made use of against these pains as were judg'd most proper, he was, about the noon of the same day, in great measure reliev'd; and though his pulse was very weak, yet he was very brisk and chearful. Having slept after dinner, he felt, when he awoke, the same pains that he felt in the morning. For which reason, he began to walk about his chamber; for by this means he bore them more easily. But after having done this sufficiently, and gone to bed again, he complain'd of fumes ascending to his head, and of streightness at his chest, and turn'd himself from one posture to another with restlessness and anxiety. And having done this for a considerable time, he on a sudden perceiv'd that he was dying; and growing pale, and tossing at the same time, he instantly expir'd.

Upon opening the abdomen, every thing appear'd to be in its natural state. But when the thorax was open'd, and the lungs, which had been forc'd forwards, were remov'd, the pericardium was found to be distended with black and coagulated blood. This blood had issu'd out of the left ventricle of the heart, through a fissure half an inch in length, and in the longitudinal direction of the ventricle, about which the fibres of the heart were seen to be destroy'd by a corrosion that was not recent.

9. Without doubt, what the case of Trombelli (*b*) had demonstrated, is confirm'd to us by this; I mean, that those erosions in the skin, which we are impatient of, being repell'd from thence, frequently attack the internal parts, and bring on an unexpected death. For which reason we ought, first of all, to take care not to heal up external ulcers, and other disorders of that kind, that have been of long continuance, without a long deliberation, and that even debated again and again; and, in the second place, where they have been cur'd more by internal than external remedies, that the patient solicitously avoid every thing from whence corrosive particles may be afresh generated in the constitution: and again, that if any new indispositions begin to arise, art may do all in its power, to endeavour to bring back those former erosions; and if they cannot be brought back, that others may be supplied in their room: and last of all, when the first tokens of an internal disorder have discover'd themselves, especially in the thorax, notwithstanding they may be slight, obscure, and ambiguous, and as you will perceive, by comparing them together, generally different, in different persons; that the phy-

(*b*) Vid. Epist. 26. n. 39.

sician be upon his guard, and fearful lest any thing terrible should be cherish'd within; so that if he has it not in his power to prevent the generation and progress of this evil, by diminishing the acrimony, quantity, and encreas'd motion; or to prevent its breaking forth suddenly at last; yet he may at least endeavour to protract it as long as possible; at the same time not entirely concealing his suspicions among the domestics of the patient.

10, And as to the last observation of this kind, which was made upon a most powerful monarch, in whom the left ventricle of the heart was found to be ruptur'd into an oblong fissure, you do not expect, I suppose, that I should speak of that; inasmuch as it is a circumstance not unknown to you, and even not unknown to the whole world.

If you compare this observation with the other nine that I have produced out of the ten, or at least out of the eight; for the second relates to a fistula, that was the consequence of a wound, and the fourth is imperfect; you will find one, and no more, in which the right ventricle was found to be ruptur'd; whereas the remaining seven all give an account of the rupture of the left ventricle. And to these add others, of which I have been inform'd at the time I was revising this letter. For to pass over that which Michelotti (*e*) points out, in an ambiguous manner, from Santorini, as if similar to that which has been describ'd above (*d*) by me, in the Venetian woman; there is no doubt, but in the two which Mariana, whom I have already spoken of with just praise, has since communicated to me, and which I shall communicate to you in another letter (*e*); one taken from a man of noble rank, and the other from a certain physician; but the left ventricle of the heart was pierc'd through. But to what cause shall we ascribe, that a rupture happens so much less frequently in that place, where there seems to be so much the more reason for apprehending it; as the thickness of the parietes of the right ventricle, and the strength of it, are so much the more inconsiderable, when compar'd with the left ventricle? First, the lower part of the left, in which the rupture happen'd in the fifth and sixth observation that have been given you (*f*), is more thin and weak than the parietes of the right ventricle. And secondly, in proportion as the strength of the left ventricle is greater than that of the right, so much the more forcibly does it act upon its own parietes, especially when any obstacle opposes itself to the blood which is coming out from that cavity; so that if any part of it be, either by reason of an ulcer, or on any other account whatever, whether in consequence of disease, or originally from the birth, less strong than a natural and good structure requires it to be, it cannot be equal to so great a force; but the parietes in that part, although in others, and even in the parts round about also, sufficiently thick and strong, as in the observation of Harvey (*g*), must at length be burst asunder, and open'd into a foramen.

There was, also, besides those that are produc'd, the observation of that celebrated man Christian Vater (*b*), of the right ventricle of the heart, "not far from the apex, where it coheres to the septum, as if by means of a

(*c*). Comment. de Bonon. Sc. Acad. Tom. 1.
in Opus.
(*d*) n. 2.

(*e*) Epist. 64. n. 14. & 15.
(*f*) n. 2. & 5. (*g*) supra, n. 1.
(*b*) Eph. N. C. Dec. 3. A. 9. Obs. 164.

“ future, being ruptur’d beyond the length of the finger-nail of a man.” But because that rupture happen’d entirely from a most violent blow that was given to the person by a carriage, which was passing him; and because it happen’d at that very instant of time, without any previous morbid disposition of the heart, it was, for that reason, not related among the others, which suited the purpose of our enquiry. And thus far of sudden death from a rupture of the heart.

11. Now that which happens from other disorders of the heart, is to be attended to. Out of which, as I have already shown by histories produc’d in other places (*i*), that the dilatation of this viscus has brought on deaths, which have been either more speedy than expectation, or entirely sudden; and as it is not my custom to repeat over again what I have once given you, I am pleas’d that I have it in my power at present to give you a new observation; by which this doctrine is very clearly and plainly confirm’d. This observation is one of my friend Mediavia’s, that was made about the beginning of March, in the year 1741; and communicated to me on the same day it was made.

12. A young man of an excellent habit and proper conformation of body, and of a good stature, having been long troubl’d with a difficulty of breathing, was reliev’d by blood bursting forth every now and then from the nostrils. But after he had begun to be deficient in this discharge, happening to take a long journey from Trent to Padua; which he perform’d, partly on foot and partly on horseback, within the space of two days; immediately after coming off his journey, and while he was stooping to his portmanteau, which was laid on the ground, he fell down dead.

The thorax being cut into, on the day following, the vessels of the neck and the head were previously observ’d to be very turgid with blood. But when this cavity was open’d, there appear’d to be no extravasation in it; nor were the lungs seen to adhere any where to the pleura. Both the lobes of this viscus, however, were livid, from the blood stagnating in them: and they were small besides, by reason of the vast magnitude of the heart; which, when the pericardium was cut into, where there was no small quantity of reddish serum, appear’d to be even bigger than that of a bullock. And indeed the auricles, and the right ventricle, were larger than usual: yet the greatest bigness was observ’d to be in the left ventricle. Nor was this owing to the parietes, which were not thicker than usual; but to the cavity of the ventricle being dilated to such a degree, that nothing could be conceiv’d as being more so; and not only fill’d with a quantity of black blood, (that had not form’d itself into polypous concretions, though it was somewhat collected into grumous coagula) like the other cavities of the heart, but also distended therewith. Besides these appearances, the semilunar valves, which lie at the orifice of it, were not bony, indeed, but hard, and what immediately occur’d to the eyes, very small; for they were contracted and corrugated. But the great artery, although it was not larger than it naturally is, yet in proportion as it receded from the heart, so much the thinner than usual were its coats. Nor was its internal surface entirely free from

(*i*) ut Epist. 18. n. 2. 8. 14. & Epist. 24. n. 13.

longitudinal furrows; notwithstanding they were somewhat obscure. However, in the heart, and the whole thorax, there was nothing besides, that was not natural. To open the belly and the head after these appearances, seem'd quite superfluous; especially as he had never made any complaints of the one or the other.

13. If this young man had made use of the hint that nature had given him; I mean, if he had taken care, after the blood had ceased to flow from his nostrils, to have some taken away at proper times, by opening a vein, he either would not have died thus at all, or at least would not have died so soon. It is a good argument to show physicians what ought to be done, where any person, particularly of such an age, and of such a habit of body, begins to be deficient in an evacuation of that kind: especially if the same person be liable to any disorder; as this young man was to a difficulty of respiration.

And to this you will find that most of the others had been subject, whom I have already describ'd to you (*k*), as having died suddenly of a dilated heart, if you turn once more to their histories. So, also, in this eleventh section of the Sepulchretum (*l*), you may see, that a coachman, who died suddenly in his carriage, and whose heart was "larger than that of any bullock," often "suppos'd that he was about to be suffocated," unless he applied his hand very hard to the thorax and abdomen; in the same manner as another that you read of in Harvey's works (*m*); in whom "the substance of the heart, and the cavities of the ventricles," being distended with blood, equall'd "the magnitude of the heart of an ox;" perceiv'd some alleviation to the very great oppression of the heart and the chest, when the whole region of the thorax was compress'd by a very strong man; and "squeeze'd" and kneaded, just as a baker kneads his bread." I suppose, because by both of these means, the motion of the blood was help'd on. You will read of another also, in the same section (*n*), who was snatch'd away by a sudden death; the heart "far exceeding its natural bulk, and being full of black blood;" and who, as appears sufficiently clear from other things that are added, had drawn his breath with difficulty. And in the second section of this second book (*o*), a young woman is spoken of, who was "suddenly suffocated," without any evident cause: in whom the heart "was twice as big as its ordinary size;" and in it, as is more expressly said in the scholium, had "a large quantity of blood:" which magnitude of the heart, whether it happen'd from disease, or was the result of a natural formation, in that young woman, which is in the same place suppos'd, as the heart was, for that reason, of a greater weight than it is in others, and had, therefore, a greater difficulty in performing its motions; it must have been more prone to delay the motion of the blood in itself, and consequently in the lungs; particularly in a paralytic woman. For on this account, Lancisi has exceedingly well judg'd (*p*), that if they who happen to have the heart bigger than usual from the birth, have the powers, by which the muscles are put into

(*k*) Vid. supra, ad n. 11.

(*l*) Obf. 24.

(*m*) De Circul. Sangu. Exerc. 3.

(*n*) Obf. 30.

(*o*) Obf. 33.

(*p*) De Mot. Cord. Propos. 38. in fin.

motion, diminish'd from any cause whatever ; as, for instance, merely from life being pretty far advanc'd ; the blood easily stagnates in the heart, and brings on an aneurism. But although a great bulk of the heart, either by overloading the diaphragm, or even by compressing the lungs, as very evidently appear'd in that young man of whom we are speaking, is injurious to respiration ; as I have elsewhere hinted : yet even the dilatation of the left ventricle alone, which we here attend to, will be the cause, that in proportion as less blood can be sent out of that cavity into the aorta, so much less, in proportion, can be received from the lungs : from whence, not only a difficulty of breathing arises, by reason of the lungs being oppress'd with blood, but at length a sudden death ; where that ventricle, being continually more and more relax'd, is at length overwhelm'd with so great a quantity of blood, that it can by no means contract itself. But the quantity of blood with which, not only in these cases, but also in others, of sudden death, this ventricle has been seen to be fill'd pretty frequently : as for example, not to digress far from hence, in that woman of princely rank, whom I took notice of above from Morand (q) ; and in the servant maid, who is spoken of in this very eleventh section of the Sepulchretum, observation the eleventh ; and in others, without doubt, that are mention'd in the same section, under observation the ninth ; or in the additamenta, observation the first : I say, this quantity of blood prevents me from agreeing with those, who, without any distinction of causes, or circumstances, assert, in a general manner, " that " in persons who die suddenly, the right side of the heart is generally found " to be fill'd with blood, and the left side to be empty."

14. You will, perhaps, ask, why, as all the four cavities of the heart were dilated in the young man in question, the dilatation of the left ventricle was, nevertheless, the greatest ? Without doubt, because the dilatation of this ventricle had given rise to the dilatation of the other ventricle and the two auricles ; that is, by admitting a less quantity of blood than it ought, for the reason which I just now gave you ; and, in consequence of this obstruction, by retarding the motion of the blood in the left auricle, in the lungs, in the right ventricle, and its adjoining auricle. But why was the left ventricle the first of all to be dilated ? Why, certainly, because the semilunar valves, whatever the cause of this circumstance might be, having been contracted and corrugated, could not properly expand themselves, so as to prevent the blood from being, in part, sent back into the ventricle ; from whence it came, during the constriction of the aorta : which part of the blood would, perhaps, have been less, if the coats of the more distant parts of the aorta had been able to drive on towards the veins the proper quantity of blood which it had receiv'd ; but this the thinness of these coats, that is, the decreas'd number of their fleshy and elastic fibres, did not permit. But these circumstances I do not explain at large, partly because they are of themselves sufficiently clear, and partly because they have been explain'd sufficiently on a former occasion (r).

15. This, however, is always to be observ'd, that aneurisms of the heart, like aneurisms of the aorta, are not so necessary causes of sudden death as

(q) N. 7.

(r) Epist. 23. n. 9.

ruptures of the heart or the aorta are. And even those dilatations, except they proceed so far, that, upon the addition of some other new cause from within, or from without, the circulation of the blood must instantly and naturally cease, would rather bring on a slow than a sudden death. Of which circumstance, although many observations are extant, and are even not wanting in my letters to you; yet in regard to the heart itself, of which we treat here, look into those two that you have in the Sepulchretum (*s*); the one of Thomas Bartholin, in which "the heart" is describ'd "as being so large, that it is frequently not larger in oxen;" the other of Otto Heurnius, in which it is said that the heart "had exceeded its common magnitude about four times." You will find that neither of the patients was snatch'd away by a sudden death, but, on the contrary, that both of them were consum'd by a slow disease. And you will moreover observe, that there was in the heart of both of them an appearance, on the account of which I chiefly took notice of these two observations. For the first of them had, under the root of the great artery, "a *cartilago triquetra*, or a bone somewhat spongy and friable, not unlike some of the calculi which are discharg'd by the urinary passages;" and the second had, "in the villi of the intermediate septum, three calculi, about the bigness of a pea, as yet not very hard and solid, but sandy, as it were, and easily giving way to the razor." You see, then, that sudden death had not happen'd even on account of these other disorders of the heart: nor will you read that it had happen'd to the young man (*t*) in whose heart Platerus found "a bone consisting of three joints, hollow, and fill'd with a kind of sandy matter;" nor to that merchant (*u*) in whom the right ventricle of the heart was internally so "hard, every where rough, and in some measure scaly, that the hand being thrust into it" by Smetius, "it was hurt with the roughness of the scales." Which instances, and others of the like kind, I quoted to some of my friends, that they might not readily ascribe a sudden death to bones that were seen in the heart of a man, whose dissection usher'd in the anatomical demonstrations of this theatre, in the year 1745. What I observ'd to be preternatural in that body, since I have spoken of it by accident, I will add here in a few words.

16. A beggar, who had been before by trade a wool-comber, of fifty years of age, being burnt up with a hot and consumptive fever in the most cold season of the year; for the month of January drew almost to its conclusion; so that he was wont to sleep naked upon straw in his little cottage, was found dead one morning in this situation.

The abdomen being open'd, I saw somewhat more moisture in that cavity than there generally is in a natural state: the stomach was distended very much, and cover'd pretty thick with the omentum, that was in great measure drawn up. Within it had a great quantity of air, and still a small quantity of wine, with the colour of which it was ting'd. The glands of the mesentery, not only in the center of it, where they were crowded together after the manner of a double cluster of grapes that was not large, but in other places also, up and down, where they lay at some distance from each other, were larger

(*t*) L. 2. S. 7. Obs. 83. & S. 8. Obs. 15.

(*u*) Ibid. Obs. 14. § 9.

(*r*) Sect. ead. 8. Obs. 24.

than they naturally are, and somewhat hard. The spleen was rather small; whereas the liver was of a moderate size, and the splenic artery thicker in proportion than the spleen. The other viscera of the belly were very found.

In the thorax I chiefly examin'd the heart, which was not small, but flaccid. In this viscus every thing was natural, except that externally, nearly in the middle of its posterior surface, it had a bony scale, of no inconsiderable size, and another much less than this, externally likewise, in the right auricle. Both of these scales were so connected to the membrane of the heart and the auricle, that they adher'd, nevertheless, more closely to the fleshy fibres, without the laceration of which they could not be separated. The other parts of the thorax, and much less those of the head, it was not in my power accurately to examine; as having, in the mean while, got a more proper subject for our anatomical demonstrations, I was prevented by close observation upon this, beside my usual office of teaching. Yet in the former of these cavities, I remember to have seen the internal surface of the aorta, even behind the femilunar valves, mark'd with whitish spots, which I had also observ'd near its division into the iliacs, and even in the iliacs themselves.

17. I would fain have known some particulars in relation to this beggar, if it had been possible; as, for instance, to what disorders he had, or had not, been subject, while he was living; and have found time likewise for examining minutely into his lungs, as he had been a wool-comber, and was very much emaciated; and, as he had died of a sudden death, I should have been glad also, to have dissected the brain. At present, all we can do with much propriety, is to conjecture what part the cold, or, if you please, what part those bony scales of the heart, had also had in occasioning his death; although these scales do not seem to me to have had any great part in producing it, when I call to mind what I said above (x), that I had then taken notice of to my friends. But if you suppose those instances to have but little relation to the present purpose, inasmuch as they are instances of calculi rather than of bones, I will not here dispute whether all these bodies were really calculous; and even, if they were, whether they might not themselves be injurious to the heart, if my bony laminæ were as injurious as you imagine: but I will add other examples, in which neither you nor I doubt but there were true bones. For I cannot be of opinion with those, who, excepting the arteries and the falciform process of the dura mater, do not seem to allow of bony concretions being found elsewhere, but rather look upon them as tartareous and calculous formations: neither can I agree with those who think that the heart and the arteries are, in general, the only parts that can be chang'd into true bones. But I confide not only in those who have sometimes seen concretions not truly bony in the heart and arteries, but also in myself, as well as others, by whom real bones have been seen in the heart and the arteries. But of the arteries hereafter. Let us now first consider of what relates to the heart.

Our Columbus (y) saw the septum of the heart, in some bodies, really cartilaginous; and, in like manner, our Vesslingius (z) saw the left ventricle "in-

(x) N. 15.

(y) De Re Anat. l. 15.

(z) Obs. Anat. & Epist. Med. 15.

"ternally surrounded with a cartilaginous crust," not with bone indeed, as some say. And in this second book of the Sepulchretum, section the first (*a*), and second (*b*), you have, "near to the left auricle of the heart, a cartilaginous excrescence," and even the auricles themselves "very hard and cartilaginous." And where cartilage is, there it does not seem to be doubtful but a true bone may be form'd. For which reason, it is not to be wonder'd at that others, as well as I, have found bones in the heart; nor that Dionis, as I have already related (*c*), found the right auricle thereof to be internally cover'd with a bony and scaly substance. But if any one should say that these bones belong'd to the membranes, and not to the fleshy fibres; and that these cartilages were not true cartilages, but call'd so from their similitude in hardness, just as the vagina uteri in old women is said to be cartilaginous; although either these bones in membranes, or those cartilages in the fleshy fibres, must by their hardness also have been injurious to the motions of the heart and the auricles; I will not contest it with him, but will rather attack him by another method of reasoning. For it is certain, that the fleshy fibres of the heart themselves sometimes degenerate into a tendinous hardness.

Albertini (*d*), therefore, saw in some bodies, "that the substance of the heart, from the basis to more than half its extent, had become tendinous, as it were, both in its consistence and colour:" which kind of metamorphosis I have in my power to confirm, if there were any occasion, by an observation of my own (*e*). And that bones may be form'd from tendons, especially in the advance of life, is not only demonstrated by the observation of Veslingius (*f*), who, if he did not find all the tendons going to the legs and ankles of a very decrepid old man "bony," as some assert, at least, found them "almost bony;" but even very evidently prov'd by the frequent inspections of others, join'd with those observations upon the feet of brute animals, and particularly of birds, which have already long been publish'd. But let these things be said, not because observations are wanting of bones being found in the fleshy substance of the heart itself; but that it may not be objected, that these might not have been true bones, unless, perhaps, by those who would contend, in opposition to the testimony of the senses, that even those tendons of birds were not converted into bones, but rather into a calculous substance: for it is past a doubt, to take no notice of other circumstances, that these tendons were so far of the nature of bone, rather than of calculus, that as long as they continue to be thin filaments, or thin lamellæ, we may bend them just as we should hoofs, or horny laminæ; and they, immediately after flexion, restore themselves to their previous state of straitness: whereas if they had been formations of calculous or tartareous matter, they would have been instantly broken upon bending, and have been shiver'd into a number of fragments.

(*a*) Obf. 32.

(*b*) Obf. 2.

(*c*) Epist. 18. n. 11, & 12.

(*d*) Comment. de Bonon. Sc. Acad. Tom. 1. in Opuscul.

(*e*) Vid. Epist. 45. n. 23.

(*f*) Epist. cit. 15.

18. But to come now to examples; I will not here quote the celebrated Reimannus (*g*), because, after having told us, that he had seen “the carnea columnæ,” which lie at the sides of one of “the ventricles of the heart, entirely ossified,” he immediately subjoins the following words, “or, if you would rather have it so, indurated like a flint;” but I will rather use my own more ancient observations: and although I made these in the years 1707 and 1717, yet I still very well know, that they were not flints or calculi which I saw in the fleshy substance of the heart, but real and genuine bones. One of these observations you have in this letter (*b*), the other in the third (*i*); and both of them written in such a manner, as readily to show you, that the persons to whom these hearts belong’d, had been carried away, indeed, by a sudden death, but not on account of that bone. For in the year 1719, I had only mention’d each of these bones, that is to say, in the fifth of the *Adversaria* (*k*). But I had, nevertheless, in that place, as I imagine, sufficiently demonstrated, that neither of them had been indurated in a part of the heart, where a tendon is naturally so thick, in particular, as the thickness of the one, and the situation of the other, requir’d. In my opinion, therefore, both of them seem to have consisted of fleshy fibres, previously chang’d into tendon, by the force of the disease (*l*). I afterwards read that Boerhaave (*m*), as he had sometimes seen “tendons to have been shoots, as it were, of bone,” so he had also seen, “that the septum of the heart, and its cavities, had put on a bony nature.” And in particular I read in the History of the Royal Academy of Sciences at Paris, in the year 1726, that the famous surgeon Garengot had found a bone much longer than either of mine, so that it reach’d to both the ventricles of the heart; nor did it only lie latent among the fleshy fibres externally, as mine did, but even appear’d internally; for which reason it was much more easy to conclude, that these fibres themselves had been chang’d into bone. To this observation I see that another is now added, of a bone which was much larger, so as to equal almost the palm of the hand, and to be produc’d from the external surfaces of the heart, and particularly from the posterior quite to the internal fibres of the ventricles, which were already somewhat cartilaginous. Nor were cartilaginous interstices wanting between the bony substance. You will find this history related by the very illustrious Senac (*n*): who also testifies, that he himself had seen the left ventricle, in another body, and the carnea columnæ also, chang’d into a bony substance (*o*). Nor did the observations of those persons escape this very learned man, who have asserted, that they had not seen bones, but stones, in the substance of the heart; and he has even given a considerable number of them collected together (*p*); not concealing, however, which in particular he suppos’d even among these to have been made up of a bony substance, although not well form’d; not doubting, in regard to the remaining observations (*q*), in which it was more perfectly form’d, but the fleshy fibres of the heart, though after the membranous and

(*g*) Agt. N. C. Tom. 1. Obf. 170.

(*b*) n. 2.

(*i*) n. 22.

(*k*) Animad. 14.

(*l*) Vid. Epist. 45, n. 23. & 26.

(*m*) Prælect. ad Instit. § 478.

(*n*) Traité du Cœur, l. 4. ch. 9. n. 5. ad fin.

(*o*) l. 2. ch. 9. n. 10.

(*p*) l. 4. ch. 9. n. 4.

(*q*) n. 5.

tendinous fibres, were themselves really ossified; or if any of the parts of the heart can become cartilaginous; but that this is a step to their becoming bony afterwards. To return, however, to the observation of Garengot, although the bone describ'd by him, in proportion as it was larger than those of mine, must so much the more have diminish'd the force of the heart, as this always decreases in proportion to the decrease of the fleshy fibres, and have been so much the more prejudicial to both the motions of the heart, by its inflexible hardness; yet I read that it was found in a man who had liv'd to the age of seventy-two; and that he was taken off by a sudden accident, I do not read; nor yet that any one of those persons was, in whose hearts either calculi or bones, as I have already said, were observ'd. That one person alone, by name Schomberg, would be to be excepted, who, as you will see in the *Sepulchretum* itself (*r*), Thuanus relates, "was instantaneously kill'd in his carriage, his breath being as it were intercepted," if it were certain that the cause of his death, which he subjoins, ought to be understood as it is understood in the *Sepulchretum*; I mean, "that the pericardium, and the left region of the heart, were become bony."

But if the words of Thuanus are well consider'd, "the membrane, and all the fleshy part which covers the left region of the heart, and which for the continual use of respiration is dilated and compress'd, was found to be universally bony, from immoderate heat, and a too liberal diet, so as to impede the power of respiration;" I am very much afraid, that most persons will think, that, together with the left part of the pericardium, the neighbouring flesh of the lungs, as was at that time the custom of speaking, was intended to be understood, especially in a man who "had already labour'd for a long time under a difficulty of breathing, and who was suppos'd to have been snatch'd away by a sudden suffocation."

19. Nor do I think that you have any right to interrupt me here, by objecting to this two of the observations that we have in this eleventh section of the *Sepulchretum*, the twenty-sixth and the fifty-sixth. Wherein a sudden death is suppos'd to have happen'd from the *valvulæ semilunares*, or *mitrales*, being made bony. For any insuperable obstacle, of whatever kind it may be, and not only a bony one, when it precludes the egress of the blood from the left ventricle of the heart, or the ingress into it, may, without doubt, be the cause of death, nor indeed relates to the present dispute. For here our enquiry is, in regard to bones being found in the heart itself, and not in the substance of the arteries or valves: although, by our ancestors, these were also call'd bones of the heart. But most persons, since the restitution of anatomy, have rightly judg'd that they belong'd to the root of the aorta in old animals; of which opinion also was Riolanus (*s*), in whose commentary you will see the passages of Galen, and even of Aristotle, and of others pointed out. Nor yet did Aristotle, who is quoted by Ingrassia (*t*), acknowledge them to be found in all large animals; for he has said that they were found not in all the species of the ox or cow kind, but in "a certain species:" and that he "having dissected a great number of hearts of

(*r*) 1. 2. S. 2. Obs. 27.

(*t*) Comment. in 1. ejusd. c. 24. ad text. 3.

(*s*) Comm. in 1. Galeni de Ossib. post. c. 32.

"different:

"different animals of this kind, had found a perfect bone in one only, notwithstanding the creatures were old," and this belonging to the root of the aorta. But in the other, "he had very rarely seen, that a bony cartilage could be said to have been there, and much less a cartilaginous bone." And it sometimes happens, that the same things are observ'd in men. Thus Harvey (*u*) mentions, that in a very noble and brave man, "part of the great artery, near the heart, was turn'd into a round bone." But more frequently, particularly in persons more advanc'd in life, has a bone of another form been seen there. So Bartholin (*x*) describes "a triangular bone," in Pope Urban the eighth: which I suppos'd to refer to the present question, not so much because he says, that it was "in the left ventricle of the heart," as because he subjoins that it was "frequent in old men:" although the reason which he gives for this appearance, is by no means satisfactory; I mean, "that this happen'd from the very great providence of nature, that the blood, which would otherwise be torpid, may be stirr'd up to motion by a stimulus, as it were, being added." Both of these bones have been taken notice of by Raygerus (*y*); and if the remainder of his words, that are made use of in the twenty-sixth observation, just now cited, had been a little more accurately copied in the Sepulchretum, we should have read not that this was "unusual in man," but that it was "almost unusual, or at least very rare." But the valves of the aorta, since the time in which he wrote, have not been so rarely found to be bony; although where there was no other disorder besides, it was but very seldom that a sudden death could be, with justice, imputed to them. For unless they do, at length, preclude the passage of the blood, as I said a little above, they do not bring on a death of this kind: and indeed the great number of examples of bony valves, many of which I have already taken notice of to you (*z*), were rarely join'd with this event; and before they were attended therewith in the few cases, other disorders had not been wanting, which might either be joint causes of bringing it on, or might, at least, serve to foretel it: one of which, to give examples here from the *Commercium Litterarium*, you see in the observation of the celebrated Trew (*a*); whereas, beside the valves being quite rigid and hard, and "barely not quite shutting up" the orifice of the aorta, "the whole circumference" of the same artery was, "near its beginning, hard and inflexible;" and another in the observation of the celebrated Kramerus (*b*), who observes that an asthma had preceded a sudden death from "the ossification" of the valves. With justice, therefore, did Raygerus doubt in his case, whether those bony valves "had been the causes of so sudden a death; as" it did not seem "credible" to him, "that they had obstructed the circulation of the blood;" nor indeed does it seem credible to me, as I read of no disorder to which the man had been subject before. And if there was found "nothing morbid in the whole body" besides, which being join'd with the valves, might preclude the egress of the blood, or otherwise obstruct its motion, I will not say that sufficient enquiry

(*u*) De Circul. Sangu. Exerc. 3.

(*x*) Cent. 2. Hist. Anat. 45.

(*y*) Eph. N. C. Dec. 1. A. 3. Obs. 282.

(*z*) Epist. 23. n. 12. 13.

(*a*) Not. 1. post Praefat. A. 1736.

(*b*) Hebd. 9. n. 2.

was not made; I will readily say, that it must have lain hid in the nerves; or rather, that it ought to be acknowledg'd, in so excited a motion of the blood, to which, and the quantity thereof, being both very greatly increas'd at the same time, the valves when thus affected could not sufficiently correspond; if this really be, as I suspect, and as you will be better able to judge by comparing them, the same history with that which is mention'd by the celebrated Senac (c) from Gayantius, a Parisian surgeon. For the man had not only taken "a good breakfast," but also a very large quantity of wine, before he died suddenly. And thus you see so much the more, that these bony valves do not relate to our present dispute, not only because the sudden death was not owing to them alone; but because they, as is before said, belong to the class of bones that are form'd in the arteries, and not of those that are form'd in the heart.

20. And in-regard to the bones of the arteries, which have been so often taken notice of, and in almost every letter, to you, it now follows to enquire whether they are true bones or not; as I have promis'd that I would do, not only just now (d), but in other places also.

And first of all, it is clear beyond a doubt, that many concretions, which, if hardness alone were consider'd, might be taken by a hasty anatomist for bones, and which perhaps have been sometimes taken for them, ought accurately to be distinguish'd from them, and to be call'd stony, tophaceous, gypseous, and, what happens more frequently, calculous, as the various nature of each seems to approach more nearly to that of a stone, a toph, gypsum, and calculi, which are more frequently form'd in the kidneys or the bladder of urine. And as I have acknowledg'd, at different times, that this does take place in other parts of the body, and particularly in the pineal gland (e); so, also, I have readily acknowledg'd, in the twenty-third letter (f), that it takes place in the arteries, where I took notice of the observation of Greiselius, as being much clearer than others, of part of an artery being "friable into sand." And as we spoke there particularly of the valves, I now add the observation of the celebrated Chomel (g); who, when he describes stony tubercles, so fix'd externally and internally to the surface of the pulmonary artery, that the external and internal were contiguous to one another in some places, asserts, that all of them were made up "of many stony granules." And although it never happen'd to me, even to this very day, among so many hard laminæ which I have seen in the arteries, to observe any one that was friable and could be resolv'd into sand, or which seem'd to be made up of stony granules; I do not, however, doubt, but that which has not happen'd to me may have happen'd to others sometimes, or, if you please, frequently.

Nor do I doubt, but the same persons, when they threw their lamellæ upon burning coals, perceiv'd no foetid smell from them, such as comes from burning bones; and that they also saw no blackness in them. I hope, however, I shall be pardon'd by these celebrated gentlemen, if I think differently

(c) Ch. 9. n. 5. cit. supra ad n. 18.

(d) N. 17.

(e) Epist. 5. n. 12.

(f) N. 9.

(g) Hist. de l'Acad. R. des Sc. A. 1707.

Obl. Anat. 3.

from them in regard to the lamellæ that I have met with ; as, having made the same experiment more than once, I have perceiv'd this smell, and have seen this blackness ; especially as I found those which were at that time pretty thin, and very flexible, like a hoof or a horn ; and as I saw that the thicker and harder ones, while I attempted to bend them with considerable force, were broken in the same manner as if I should break a bony plate, and heard them make the same kind of noise in breaking as a plate of bone naturally makes in being broken ; and that there was not one from which any dust or powder fell at the time of breaking, although it was perfectly dried. Shall I, therefore, call lamellæ of this kind stony, tophaceous, gypseous, calculous, or bony ? Rather say, you will perhaps answer, that they are like bones. Thus Vernouius (*b*) suppos'd of a substance concentered in an aneurism of the aorta, which was not equally friable with a calculus, but more flexible, and which, when put on the fire, exhal'd the odour proper to bones, " that it " was more inclin'd to the substance of bone." So the celebrated Haller (*c*) has said, that there were scales in another aneurism of the same artery, which were, " for the most part, bony, or like bone." I shall not, however, enquire whether they have, by saying these things, said any more than that they had a similarity to bones ; nor will I say, that the first had there, however, been speaking of a substance, which, " when judg'd of by the touch," was " like a calculus ;" and the other of those very scales which the celebrated Winklerus, who is worthy of so great a preceptor, in a dissertation dedicated to him (*d*), had call'd " stony scales," inasmuch as (*e*) " when burnt they did " not become black," and had all the " qualities " of a true stony body : I will not, I say, make this reply ; but this one thing I will say, that I also consider no more than the similitude when I call them bony ; nor when I say that they were really bony, or true bones, not only in the arteries, but in other parts of the body, do I mean any thing more than to prevent you from being apt to suspect, that any kind of hard concretions whatever had been taken by me hastily and too readily for bony ones ; but to make you understand for a certainty, that those which I call bony, when attentively consider'd, have really seem'd to be so much the more similar to bony concretions, in proportion as they were more unlike stony, tophaceous, gypseous, and calculous concretions.

This, therefore, is sufficient for me. Nor did it ever come into my mind, when I was speaking of these morbid bones, to suppose that the same elegant structure was also given to them, that was given to the natural bones ; that they had the same kind of periosteum, sanguiferous vessels, and medullary oil : although I wonder, that some of those who contend for the concretions in which these circumstances are wanting, not being call'd bony, but earthy, should reckon the cartilages of the larynx, in which I have frequently seen, when become bony through old age, that none of these circumstances were wanting (*m*) among the examples of stony concretions. Why they do this, I am not sufficiently inform'd, as they have readily affirm'd, on the other

(*b*) Comment. Imp. Acad. Petropol. Tom.

6. Cl. Phys. art. 4.

(*c*) Opusc. Pathol. Obf. 18.

(*d*) De Vaso. Corp. hum. Lithias. S. 1. § 7.

(*e*) S. 2. § 5.

(*m*) Vid. ex parte Advers. l. n. 23.

hand, that the indurated meninges and cartilages, in particular, are very nearly akin to true bones: and that others except no cartilages besides those which were already become bony before the body was perfected. These last persons do not except even the concretions of the meninges; and even expressly pronounce, that those which are generated in the falciform process are earthy. Yet I do not deny that such may have been found by these very excellent men; and, which is their general objection, such as show nothing regular in them, nor so much as fibres, even if you use the microscope. Neither can you deny, when you have inspected that larger bone formerly found by me in this process, without making use of a microscope; or have read over again its description (*n*), that it is of the same class with those which the illustrious Haller (*o*) has lately describ'd as being found in the same place, "terminating in parallel fibres, after the manner of a comb." I omit others who are already quoted in another letter (*p*). For although no observations were extant of fibres being observ'd in morbid concretions, there is no doubt, that even in the callus by which broken bones are conglutinated together, after it is quite perfect, no fibres are to be met with, but a dense and compact substance: and shall we, for this reason, contend that this callus is not of the nature of bone?

In regard to the two arguments, then, that are thought to be the principal for the opinion whereof I am speaking at present, the first, which was taken from the structure, I have largely enough consider'd: particularly in those concretions in which I have said it is sufficient that there is a likeness to the nature of bone; and in which it happens of course, that the soft fibres of the parts are converted into that substance, or incrust'd with it, and finally consum'd; provided that, which at least cannot be denied, be granted, I mean, that what was before the situation of the soft fibres, is taken up by this concretion. And the other argument, taken from this consideration, that hard concretions are rarely, if ever, found in any other bodies but in those of persons pretty far advanc'd in life; whose blood, without doubt, abounds in earthy matter, can by no means attract our attention, if we call to mind, that Crellius (*q*), who was, while living, a very learned man, has brought examples to prove, "that arteries," of which our principal enquiry is here, "have been chang'd into bones, not only in persons advanc'd in age, but "at any period of life whatever;" notwithstanding he follow'd that same opinion, but explain'd in another manner. Which explanation, as it relates principally to the arteries, I can by no means pass over at present.

21. The explication therefore, or, if you please, the peculiar opinion of Crellius is (*r*), that those concretions in the arteries which are call'd bony, are, in fact, not bones, but tophaceous concretions from pus; the thinner part of which being dissipat'd, the thicker part that remains becomes indurated. For as the smaller vessels, that creep within the substance of the arteries, are obstructed with sluggish juices, and a kind of viscid lentor (of which there is great plenty in old persons, or even in intemperate young

(*n*) Epist. 3. n. 20.

(*o*) Opuscul. Pathol. Obs. 49.

(*p*) Epist. 25. n. 9.

(*q*) Obs. de arteria cordis Coronar. instar ossis indurata § 2.

(*r*) Ibid. § 8, & 9.

persons) it easily happens; that inflammation is the consequence of obstruction, and suppuration the consequence of inflammation: and that the pus is pour'd out into the cellular membrane, by which the fleshy coat of the artery is separated from the internal; and that through these cells, as they communicate one with another, sometimes a larger, and sometimes a smaller quantity of these viscid juices, in proportion to the quantity of them that is contain'd in the body, flow down, and stagnating there form a concretion. And from this cause it is, that these scales are found betwixt those two coats, unless some very considerable suppuration, or one that continues for a long time, finally corrupt and destroy these coats. Nor does he think that the smell which is discharg'd by these scales when thrown into the fire, is any objection to his hypothesis; for he acknowledges, and does not deny it, as others, of whom I have spoken above (*s*), do; and as Vernouius also (*t*) does, and Kulm (*u*), who observ'd the same thing that was observ'd by me. But although these, and before them others, amongst whom are Schrockius (*x*) and Scheidius (*y*), have made use of that experiment as a mark to distinguish bony from calculous concretions; he denies their arguments to be conclusive, and says that it does not at all repugnate to his opinion (*z*), because pus also, from whatsoever part of the body it may be taken, if it be thrown upon the burning coals, diffuses a smell and a foetid smoke, perfectly like those which bones diffuse when burnt. And when I read these and other things, which he also objects against the opinion both of Boerhaave and of others, and which I have already pointed out to you, in great measure, in the eighteenth letter (*a*), not without my answer to each, such as it is; I cannot help calling to mind my observations, the greater part of which are written to you, and allowing the consent that there is, for the most part, in each, betwixt what I had seen and what he had laid down. For that the bony lamellæ frequently either begin to be form'd even at a greater distance from the heart, or become more frequent and larger in their size; and that they do not inhere in the internal coat of the artery, but are cover'd by it; and, particularly, that considerable marks of erosion and ulceration are join'd with these lamellæ; and other things of this kind, you have read in so many of our observations, that it would be tedious and superfluous to mark them out to you separately here. It seems to me to be more useful to communicate ingenuously to you those things which I remark'd in consequence of an accurate examination, while I took some of those observations, and which I now suppose to relate in a peculiar manner to this dispute.

22. And to begin with that old man of whom I remember particularly to have promis'd you this relation (*b*); the inner coat not only cover'd that great number of even very large laminæ, but also adher'd very closely to all the hollow sides, or internal surfaces, of them, in a sound and uninjur'd state, except that at one of them only there was an aperture: in which aperture there was a matter, or rather a thickish humour, of a white and yellow colour.

(*s*) N. 20. (*t*) Citatus eod. n.

(*u*) Disput. de Ten. Achill. &c. c. 1.

(*x*) Eph. N. C. Dec. 2. A. 3. Obs. 19. in Schol.

(*y*) De duob. Offic. in cerebri, &c. qu. 2.

(*z*) § 9.

(*a*) N. 32.

(*b*) Epist. 24. n. 16.

But on the convex surface of this last lamina, and of most of the others, it was very easy to separate the annular fibres of the fleshy coat, and that without injuring them. Yet there were some laminae, to which, on the same convex surface, a matter of the same kind that I just now describ'd, that is, a white and yellow matter, adher'd: but there scarcely any fleshy fibres, and, indeed, no fleshy fibres at all, remain'd, as they were destroy'd quite to the outer coat, which was found. I would have you here call to mind another old man of whom I wrote in the seventh letter (c). The aorta of this man, that externally show'd its proper sanguiferous vessels to be much distended, which is to be consider'd as a mark of permanent inflammation, was not only beset internally with bony scales, but in some places so ulcerated, that not only the internal coat, but also the neighbouring fleshy one, seem'd to have been converted into a red and putrid substance, that came away piece-meal. And in a certain old woman, whom I shall describe hereafter (d), the aorta being, in its whole tract through the belly, in several places, and many of its branches, mark'd with yellow bony lamellae under the internal coat, was also here and there internally beset with a brown, thickish, and bloody humour, which adher'd to it up and down, as if it had distill'd from the ulcerated places. I omit other observations of the same kind, and the marks of erosion and exulceration, as it were, so often remark'd in the arteries, together with the bony scales, that is, of an ulceration *sui generis*. For what has been already advanc'd seems to be sufficient to conciliate our assent to the new opinion; inasmuch as inflammation, erosion, and a purulent humour, from which the bony lamellae are form'd, have been found in conjunction. And by one observation it appears, if this be the state of the case, that they may sometimes reach to the internal parts, and at the same time may be so continu'd as to extend themselves to the external parts; as we read in an observation of Chomel (e), that those stony concretions were in other places, that is to say, the coats on each side being at length destroy'd by erosion: by which method of reasoning, they who were followers of this opinion, perhaps, might conjecture that the observation of Scultetus is to be explain'd (f); in which the trunk of the aorta is describ'd as being "universally bony to the "length of the little finger;" and other observations similar to this; and that, also, which, being taken from Harvey, I remember to have objected to this opinion (g): but this last with more difficulty, by reason of there being a much longer tract of artery, without the least remains of coats whatever.

23. But these three circumstances, which I spoke of last, could by no means have come to pass, without a profusion of blood from the eroded artery. And notwithstanding the others seem to go a great way in confirming and defending the new opinion, is it for this reason plain, that those concretions, which are suppos'd to have arisen after inflammation and suppuration, are always tophaceous, and not bony? To me, at least, even in all those bodies that I spoke of just now, they did not seem to be tophaceous, but bony; and those which I broke asunder were broken in the same manner

(c) N. 9.

(d) Epist. 10. n. 24.

(e) Vid. *supra*. n. 20.

(f) Trichias. admir.

(g) Epist. 18. n. 23.

as plates of bone are, and made the same kind of noise in breaking. And it is one thing, that these scales are form'd after inflammations and suppurations; and another thing, that they, and other formations of this kind, are not bony. That the former may happen frequently, I can very well allow; the latter I cannot grant, but at some times. And indeed what can be the reason that our ancestors (*b*) so very constantly call'd the basis of the aorta, when indurated in old stags, a bone? or for what reason has Ingraffias (*c*) said, that he had found the same part, in an ox, converted into "the most perfect bone?" Did not Aristotle, Galen, and other very experienc'd anatomists (not to mention the apothecaries themselves, who have been us'd, for so many ages, to reduce this bone into powder) now and then, know how to distinguish a tophaceous concretion from a bony one? Or how does it happen, that when these lamellæ are found in the aorta, other parts are, at the same time, found to be chang'd into true bone also, in the same bodies? Thus Vieussens (*d*), in the same matron in whom he enumerates so great a number of arteries, which were in part ossified, relates, that in the same body even the annular cartilages of the bronchia were converted into bone. And the same thing you will find, by reading over again my letters (*l*), was seen by me in two bodies, in which the aorta contain'd bony lamellæ. And in this very letter (*m*) is describ'd a woman, who show'd that disorder in the arteries, and at the same time a bone in the substance of the heart, and additamenta of new bone, on the internal surface of the cranium. I purposely omit other observations of mine relative hereto, and amongst them some that were formerly made in the beginning of the present century, when I saw, in the same bodies, small bony scales, both in the arteries and in the pericardium. I therefore ask of you, whether it be very probable, that these concretions, which all who handled them and saw them in the various parts of the body pronounc'd to be of the same kind, were in other parts indeed bony, but in the arteries only tophaceous? Is it not more probable, that they were equally bony in every part? It will certainly be more natural for you to imagine, that in those bodies, in which the blood abounds with certain saline, earthy, and other particles, of which most authors think that bones are made up; I say, it will be more natural to imagine, that in those bodies, the same kind of particles stagnating in these places, which either naturally, or by the force of disease, are more dispos'd to retain them, do at length give origin to concretions of the same kind, in all these places, than to suppose that they are of a different kind in the arteries from what they are in all the other parts of the body.

24. You see then, that the new opinion is so far receiv'd by me, provided the scales that are form'd in the arteries are not consider'd, or in general at least, as tophaceous. Besides, I do not doubt but their formation may sometimes happen, even without previous inflammation, or at least without previous suppuration. Turn, I beg of you, to the eighteenth letter (*n*): you will find that the great artery, from the heart quite to the first orifice of the

(*b*) Vid. supra, n. 19.

(*c*) Ibid.

(*d*) Traite du Cœur. ch. 16.

(*l*) VII. n. 11. & XXIV. n. 16.

(*m*) n. 2.

(*n*) n. 2.

branches that go to the upper parts, was of so great a hardness in its parietes, that it could scarcely be cut into, even with the application of the greatest force, by reason of its substance, which, as it appear'd in sections of the artery, had already obtain'd a hardness of a middle nature, betwixt that of a ligament and a cartilage. How much then was wanting, if the man had liv'd, of this substance becoming at length bony? Shall we then believe, that the whole of this very large tract of artery could have labour'd under an inflammation and suppuration that occupied its whole substance, and neither death have been the consequence, nor even any signs of the most acute disease have been observ'd at the very time? And a disease of that kind had certainly not preceded. But what if we suppose, that in the many bodies in which I have found erosions and ulcerations of the artery, these appearances have not always, and perhaps not often, preceded the production of these bony scales; but have rather been the consequence of them? Or shall we imagine, that these very scales have been form'd out of the purulent matter, which I saw distilling at that time from the eroded places? Nay, rather, these very scales, by their edges, which are rough, and often more or less prominent, have been the cause of those erosions and ulcerations, by breaking through the internal coat. For the artery cannot contract itself without forcing the asperities, and, as it were, the sharp needle-like points of the little bones, against that coat: nor can the blood that is driven thither by the heart distend the arteries, without pressing the same coat against these sharp points.

See how Bellini (*o*) expressly accounts for the inflammation and erosion of that coat, from these little bones, which, as I have elsewhere (*p*) said, he call'd stones. His words are, "I have seen stones in the internal coat of the arteries, which had in several places destroy'd it, and in a manner inflam'd it, and were fix'd to the inflam'd places, like a crust: from whence a very acute pain arose, and a contraction of the arteries." So also Abraham Vater (*q*), who suppos'd that the little bones had been broken into smaller pieces, by the motion of the artery, says, "the extremities of these bones had perforated the internal coat." And although Brunnerus (*r*), while in describing the aorta of his father-in-law, as distinguish'd with many bones, he tells us, "that the internal coat" of the same artery was, in several places, "ruptur'd, lacerated, and rotten, like fruit, not without fear of rupture;" doubts "whether this had happen'd by violence and evulsion, or from erosion:" yet whoever observes, that this artery "had hurt the fingers when thrust into it, by the roughness of the bones, and had prick'd them by a kind of acute prominence," will easily conceive that this had not happen'd from erosion only.

And as to his saying, that it was not without danger of rupture; without doubt it really happen'd so in the old man, and the woman, of whom I wrote in the preceding letter (*s*). For I saw that in both of these persons, and particularly in the woman, the blood had made a way for itself, by rup-

(*o*) De Morb. Pest. ubi de Intermitt. Puls.

(*p*) Epist. 24. n. 17.

(*q*) Osteogen. th. 20.

(*r*) in App. ad A. 3. Dec. 3. Eph. N. C.

(*s*) XXVI. n. 15. & 17.

ture, out of the dilated aorta, where the internal coats were eroded, among the thick-flown and rough bony lamellæ: so far has Parey (t) err'd from the truth, that what he imagin'd to be oppos'd "by the providence of nature," as an obstacle and bulwark, as it were, of bony crust, to retard the impetus of the blood in the dilated artery, does itself, by perforating the coats of the artery, as certainly happen'd also in his observation, prepare a more speedy exit for the blood. And if the erosion of the coats, among these bony concretions, be very inconsiderable, so as rather to weaken than make an aperture in them, and the blood be thrown in with pretty great force, the side of the artery may be there sometimes relax'd, and swell out into an aneurism of the form of a sacculus, to the parietes of which these bones may be internally fix'd. And this being granted, it will be perhaps less difficult than was suppos'd (u), to find out a way and manner, by which a piece of bone, that was wanting in the sternum, might seem to be contain'd within an aneurism of this kind, by the force of which the clavicle had been drawn asunder. For you will easily guess, that this little part of the sternum had been really and gradually consum'd by the neighbouring aneurism, as generally happens; and that the piece of bone which was within the aneurism, had accidentally taken such a figure and size as in some measure to resemble that which was deficient in the sternum. And a conjecture of this kind agrees also, perhaps, with that piece of rib which we read was found by Lentilius (x) within another aneurism.

25. But do not, however, imagine, that I account for all these erosions of the arteries, whether they are slighter or more considerable, from the roughness of those little bones. For as this roughness is sometimes so great that it is sufficient to look upon the internal surface of the artery, or to touch it, in order to perceive, beyond a doubt, that the artery had been wounded, or lacerated therefrom: so at other times there is no roughness, or inequality, of the bones; and an erosion nevertheless appears. And, indeed, sometimes there is as yet no bony appearance, when the artery is already eroded. So in a mariner, whom I shall describe to you on a future occasion (y), there was no bony scale in the great artery; only whitish sports occur'd: but an erosion, if you examin'd it a little more attentively, was already begun. So, not to recede from those which you have describ'd to you in the letters already sent, read over again the twenty-third, and you will find the same thing observ'd by me in a man (z); but particularly in the twenty-sixth you will see, that a Venetian woman (a), who had no bony appearance in the aorta, had, nevertheless, so considerable an ulceration of this vessel, above the femi-lunar valves, that the blood had there made itself a passage whereby it was discharg'd into the pericardium. Nor has it happen'd to me alone to light on such appearances, but to others also. Turn, for instance, to the example given by Littre (b), who found an ulcer in the same part of the aorta; which I suppose was the reason, why one of those valves that lay beneath this ulcer

(t) Oper. l. 6. c. 32.

(u) Hist. de l'Acad. R. des Sc. A. 1700.

Obf. Anat. 6.

(x) Eph. N. C. Cent. 1. Obf. 96. n. 14.

(y) Epist. 42. n. 34.

(z) N. 11.

(a) N. 21.

(b) Hist. de l'Acad. R. des Sc. A. 1713.

Obf. Anat. 3.

had been glued down, as it were, to the side of the artery. Yet he does not mention a single word of any bony scale being found in that artery, or in the valves; so that I do not know by what accident it has happen'd, that some persons, among the many instances of bony valves, have put in the first place this very observation of Littre.

Wherefore, although erosions are most frequently met with in the arteries when they are beset internally with bony scales; yet even then the erosions are not all to be imputed to these scales, especially when they are smooth, and not furnish'd with sharp points and prominencies; but many of them to the same eroding particles of humours, the effects of which, it is demonstrat'd, are frequently seen even before any little bones are form'd; and the manifold nature and origin of which in the coats of the arteries are already hinted at by me, in conjunction with Lancisi, in a former letter (*c*). Besides, if it accidentally happen, that a great quantity of blood act with violence upon any arterial trunk, being assisted by a peculiar situation of the body, or the part, there is no doubt, but while the other coats are as yet found, the internal one is form'd into chinks; which is confirm'd by the experiment of the illustrious Senac (*d*) made upon the carotid artery. And from these chinks it is not only easy to deduce the origin of some of those furrows, that I have so often taken notice of, on the internal surface of the artery, but also the origin of some ulcerations which have been observ'd.

26. And if, then, there are sometimes erosions in the arteries, as I have said, before any bony scales are form'd, certainly some of these scales may have been form'd out of that purulent matter which, before the internal coat is eroded, stagnates betwixt this and the next coat, as is suppos'd by the celebrated author of the new opinion (*e*). Nor are some of the observations of Leprotti, or of mine, in regard to the seat or nature of the spots, which are the beginnings of these little bones, hastily to be objected to this opinion. For as to Leprotti describing spots (*f*) which "not only made the internal surface of the aorta rough, but were plainly seen through it on the external surface, and when the internal coat of the artery itself was disjoin'd from the others were easily crumbld away;" without doubt, either these words are so understood, as that this coat cover'd over the matter of the spots, which were therefore seen through it, and that this coat being taken away, they could then be rubb'd off; or, perhaps, they are even to be understood, as if that matter was inherent in this coat, and follow'd it when remov'd. The former of which explications surprizingly well agrees with the new opinion: and the latter may be so manag'd as to agree therewith; that is, by supposing the cellular membrane, in which this matter is, easily to follow the internal coat to which it adheres. And, certainly, bony scales are wont to be found cover'd over with this coat, not only according to my inspections, but according to the inspections of others also; and not only in the arteries, as Vaterus has observ'd (*g*), but in the veins also, as Furstius remark'd (*h*):

(*c*) Epist. 18. n. 27.

(*a*) Traité du Cœur I. 1. ch. 9. n. 3.

(*e*) Vid. supra, n. 21.

(*f*) Comment. de Bonon. Sc. Acad. Tom.

1. in Opusc.

(*g*) Loc. cit. supra, ad n. 24.

(*h*) Eph. N. C. Dec. 2. A. 10. Obs. 175.

for the latter of these gentlemen saw, that in the coronary veins of the heart, which were become bony, “ the bone was invested on both sides with a thin “ little membrane;” and to the former it appear’d “ evidently, that not the “ internal coat of the ossified artery was indurated, but the middle coat” only.

Nor much different from this observation of Vaterus are those of mine, taken from two women, the disease and dissection of one of whom I describ’d to you in the latter end of the nineteenth letter (*i*); and those of the other, I shall, perhaps, describe in a future one. Having, in the first, chosen out from that winding aorta a bony scale, and examin’d its situation; some fibres seem’d to be interpos’d betwixt that and the internal coat, very much like annular fibres in their course, but from a yellowish colour becoming white and soft; moreover, like that matter which is wont to adhere to bony lamellæ of this kind. And in the other woman, having open’d the great artery from the heart quite to the septum transversum, and having observ’d it to be here and there mark’d with whitish spots, of a greater or lesser size, such as we generally take for the beginnings of bony scales, I cut into many of the larger spots, and found that they were all made up of a substance which was not at all moist in itself or about the edges, the same being more white and more compact than that was of which the healthy parietes of the artery consisted. And it had such a situation, that beginning from the internal lamina of the artery, which it rais’d up a little inwardly, it extended itself from thence towards the convex surface of the artery, to which it certainly was not contiguous, though at no great distance therefrom. But although you perceive from these observations, that the matter from whence the bony lamellæ are form’d, does not always stagnate in the cellular contexture of the arteries, but also occupies a part of the fleshy coat that lies around it; it is, nevertheless, by no means a consequence from thence, that it does not much more frequently confine itself within the bounds of that contexture. But let us go on from the situation of these spots to their nature.

27. I said just now, that the substance of which the spots consist is more compact and more white than the healthy substance of the artery is, and without moisture besides: and by reading over again my letters, you may also find, that the marks of future ossification in the arteries, that is to say, the spots in the arteries, often approach to the nature of ligaments in their substance (*k*); and that in a certain man (*l*), they had appear’d to be of a tendinous hardness, as it were. And these appearances seem less to agree with the idea of purulent matter, of which these ossifications are made, than with that theory of Boerhaave (*m*), which supposes a compression of the small vessels that escape the senses, by which their cavities are obliterated, and many of them condens’d into one more solid, hard, and firm body. Which, although it may seem very probable, and even true in many cases; for in many cases I have found the small beginnings of these spots to be quite without moisture; and not only spots, but at the same time some of them, which were equally without moisture, already ossifying, and others I observ’d in part become

(i) N. 18.

(k) Epist. 26. n. 24.

(l) Epist. 18. n. 25. in fin.

(m) Vid. Epist. ejusd. n. 31, 32.

bony, examples of which kind you will also find in the illustrious Haller (*n*), and will object to those who look upon these spots, and other indurations of the arteries of the same kind, as *calli* that are always to remain in that state; although, I say, in many cases, that which I have said may seem not only probable, but true, yet in others even my letters show that the thing may be quite different.

For if you turn to the third letter, you will find that I have describ'd a white spot in the basiliary artery of a certain woman (*o*), belonging more to its internal than to its external parietes, and which was not made up of a more firm, but of a more soft substance. Then look into the fourth letter, and you will find, that, in an old man (*p*), two arteries going to the extremities of that artery I just now mention'd, had, each of them, a white little body, hardish, and already almost cartilaginous, which protuberated, not from their external, but from their internal surface. May it not seem very probable, that from a soft matter, such as I found in the first observation, the thinner particles being in process of time absorb'd, a little body had been form'd of a more firm contexture, such as I saw in the second? Or, at least, if you chuse rather to make it square with the reasoning of Boerhaave, does it not appear, that some beginnings of a future more hard concretion are made up of a soft matter between the coats of the arteries? And as in these bodies I found this matter white, so you may have learn'd from this very letter (*q*), that I found it to be in others of a white colour mix'd with yellow, adhering to the bony lamellæ, and these lamellæ themselves sometimes yellow. Crellius (*r*) had also found a concretion, not only "of a white colour degenerating into yellow;" which lying betwixt the coats of the artery, already "resembld the consistence of a bony lamina;" but also a matter diffus'd around it, from which he did not doubt but it had been form'd; and this "similar to that which at other times is contain'd in an atheroma, or meliceris?"

And this seems more probable to me, since I have lately read that "a yellow juice of a pultaceous consistence, and not unlike that substance which is found in an atheroma," was seen by the very illustrious Haller (*s*) in parts of the aorta which had become callous and yellow; and that in the same body were other very similar yellow places, already "coriaceous," or of the consistence of leather, "others cartilaginous, and, finally, others bony;" and that the observation of this progression from softness to the various degrees of hardness, had been "often repeated" by him: which you may also confirm from hence (*t*), that the convex surface of these scales preserves the mark of their origin from soft matter, that is, "a transverse direction, inscrib'd by so many furrows," from the fleshy fibres of the arteries adhering to them; which furrows I remember to have been formerly observ'd by me also on some of the bony scales, when I disjoin'd them from the transverse fibres of the artery.

(*n*) Opus. Pathol. Obs. 51.
 (*o*) N. 6. (*p*) N. 19.
 (*q*) N. 22, & 26.

(*r*) Obs. ad n. 20. supra cit. § 2, & 9.
 (*s*) Opusc. cit. Obs. 47.
 (*t*) Ibid. & Obs. 17.

And an argument not unlike this is us'd by Haller (u), to show that the large bony laminæ form'd on the external surface of the dura mater, had, in like manner, been made from a coalition of juices. He also thinks, moreover (x), that he has sometimes seen the first materials of a renal calculus, "which had very great affinity to the first rudiments of arterial crusts;" that is to say, a yellow mucus in the Bellinian tubes, as they are call'd; and this by degrees becoming harder: so that it brings back to my mind that progression which I have observ'd in calculi of the pineal gland, from a yellow mucous matter to a sandy, and, finally, to a concreted and hardish substance, and which I have already communicated to you (y). And there is no doubt but the matter which has often been press'd out from the extremities of those renal ducts by the celebrated Bertini (z) agrees with the observation of Haller, not only in thickness and colour, but, in short, in its earthy particles also.

In regard to all these remarks, although they deserve commendation, and may even easily be prov'd to take place in most bodies; yet, as I have frequently observ'd how many various circumstances are wont to occur to us in things that are natural, and still more in things that are preternatural; and as I have compar'd all my observations with the observations of others; I hope a pardon will be indulg'd me, if I again assert that the case happens differently in different bodies, especially in regard to those concretions of the arteries which I have here consider'd. I do not mention the colour of the juice, which I have sometimes seen to be different. But I affirm that there have been many bodies, in which, although the great artery was beset in some places with little bones, and in others with spots of a larger or smaller size, of a thicker or thinner consistence, I never, however, could find, not even in the smallest beginnings of them, any thing of juice or fluid. If in all bodies an effusion of yellow juice preceded the bony scales of the arteries, which rais'd up the internal coat towards the inside of the artery, and render'd it in several parts "convex and prominent," without doubt, you perceive, that these places could not have escap'd my eyes, when attentively inspecting the artery.

Nor do I say this because I imagine that the greater number of, and if you please all, the spots begin, increase, and ossify without any morbid juice; but I say it for this reason, because my observations testify to me, that in some bodies such a juice is indeed pour'd out; and that in others it is only brought together gradually, and without effusion, from the small arteries of the coats; so that the particles are plac'd in contact with each other. And if this juice be impregnated with particles of such a kind as are suppos'd necessary by most persons to give nutriment to bone; and if these particles are more and more brought into firm contact with each other, I suppose that concretions will arise therefrom, such as I have frequently met with, and such as resemble bone: as they would, on the other hand, be of a tephaceous or gypseous nature, or of the nature of any other similar substance, if this juice

(u) Obf. 49.

(x) Obf. 34.

(y) Epist. 5. n. 12.

(z) Mem. de l'Acad. R. des Sc. A. 1744.

should be fill'd with particles of any other kind, and they come pretty speedily into any degree of contact whatever. Of which kind I suspect those to have been, that the latter part of the excellent observation of Jano Planco will describe; which observation this very experienc'd man communicated to me by letter, accurately and at large, about the end of the year 1728, a few days after he had made it. The whole of it, therefore, for it contains many and various things; so that for this reason I promis'd it to you in the preceding letter (a), when I spoke of the eruption from the great artery into the pericardium; the whole of it, therefore, I say, I will copy with great faithfulness from these letters, and will give you with no less care than if it were my own.

28. A nobleman, who was not far from the age of fifty-nine, of a black complexion, but of a good habit of body, notwithstanding he had been much given to venery from his youth quite to that time, from whence he had been more than once troubl'd with buboes, made use of gross and common food, but drank generous wine and spirituous liquors with great freedom. He also play'd much at dice: and it was related by his comrades at play, that he was us'd to be seiz'd every day in the evening with a sneezing; so that he sometimes sneez'd a quarter of an hour, or more, and that for two or three years. At which time he also began to be emaciated, and not in a small degree neither, and to be affected with a kind of internal sensation, just as if, according to his own expression in the last months of his life, he was about to faint away. Yet he would use no other remedy, in order to recover himself, but the same spirituous liquors I have mention'd. Wherefore, returning home one day about evening, and having drunk once or twice of these spirits, and his domestics having suppos'd that he had afterwards gone out of the house, it there happen'd that he died suddenly, without any body knowing of it: and at length, after the fifth hour, his body, as it was winter, was found quite cold.

The cranium being open'd the day following, and the meninges, for the whole of the pia mater also every-where follow'd the hand that drew it, being easily remov'd, nothing was found within that had a preternatural appearance, except a great quantity of serum in the ventricles of the brain, and that of a greenish colour. But in the pia mater all the trunks of the arteries, and, in like manner, all their branches, and especially those which go towards the plexus choroides, were much more thick and hard than is natural, and when dried shew'd in many places a bony nature. And, indeed, nearly the same thing was seen throughout the dura mater in the arteries thereof, which were themselves also become somewhat thick.

But in the thorax the lungs were flaccid, and, in the greater part of them, black. The left lobe was besides every where closely connected to the pleura, where it invests the ribs and diaphragm, except where some quantity of coagulated blood was observ'd. There was a much greater quantity of this blood in the pericardium, whither it had burst, as I shall say presently, from the great artery. The heart was somewhat larger than it naturally is, by reason of the too great magnitude of the left ventricle, and the capacity of it, which ex-

ceeded that of the right ventricle by two-third parts; whereas this last-mentioned cavity, besides the great thinness of its proper parietes, had fasciculi of fibres on its inside, so entangl'd with each other that it scarcely seem'd to be a sinus. The aorta and the pulmonary artery were somewhat larger than they generally are. The latter of these vessels, however, was found; but the former was first ruptur'd at the distance of about a finger's breadth from the heart. Yet this rupture was not large; but near to it, and round all the basis of the aorta, a kind of blackness, as if from an old bruise, appear'd, which was owing to black blood stagnating under the external coat: and this blackness extended itself through the lungs in general, but particularly about the larger branches of the pulmonary artery. Besides this, the whole internal surface of the great artery was universally full of prominences and pustules, both of which were continu'd through all the branches of it that were laid open, and particularly through the subclavian arteries, the carotids, and the coronaries of the heart itself: the last of which were, moreover, very much dilated, and one in particular, so as nearly to equal the breadth of the left carotid.

In the belly the spleen was small, and very lax, although the liver was pretty sound, and in every respect natural; for as to there being but a very small portion of bile in the gall-bladder, that was, perhaps, owing to his having died but a few hours after dinner. The kidneys were very flaccid externally and internally, which is very rare, without any pelvis, the place of these being supplied by a kind of spongy substance.

As, within the belly, there was nothing besides these appearances worthy of remark; and as it was no secret, that the patient had been, more than once, affected with a lues venerea, as I have said, and that a leaden bullet from a pistol had been lodg'd in his left thigh thirty years before; the urethra and the left thigh were cut into. And in the former, one or two, and no more, of the orifices of those small canals, which I have describ'd in the first of the *Adversaria* (*b*), and of which a representation is there given, were found. And in the thigh was a membranous follicle about that bullet, with which it was streightly inclos'd all round.

Having seen these appearances, I had a mind to take out a good part of the aorta, in order to examine it more accurately, on the inside, and on the outside. And it was observ'd, that the external coat could be easily drawn away from the trunk and branches thereof, just as if it had been, for a long time, macerated in water. And when any one of the larger of these internal prominences was cut into, it show'd, internally, a kind of cavity; and in this cavity was a little softish matter, like a pulstice. But many of the smaller ones appear'd bony after they were dried.

29. Different parts of this history, which I have given you, relate to different subjects. And indeed many circumstances are already explain'd in the foregoing letters. But you see, that the remark which was made in the last place belongs particularly to the present letter: I mean, that what the lesser prominences contain'd was demonstrated by the dissection of the larger, that is, a matter like a pulstice. Since, therefore, it appear'd that from this mat-

ter, when the more humid particles were consum'd, a bone was form'd, you will at the same time perceive, I imagine, that those concretions which, I suppose, resembl'd bone, by their whiteness and hardness, had taken their origin from soft matter; for at that time this controversy was not agitated: and at the same time, by considering the very speedy induration of the same matter, you will naturally suspect with me, that if these concretions had been larger, so that they could have been examin'd by many different experiments, it must have happen'd, that they would have been found to be more similar to tophaceous or gypseous matter, than real and genuine bone. Nor is my opinion different in regard to the arteries creeping through the meninges, which, after being dried, have appear'd bony in several places. For it is much more probable, that the same kind of prominences, which was propagated from the trunk of the aorta into the larger branches of it, had moreover been continu'd from these to those lesser ones, and had shown the same effect.

30. But as to the same gentleman, who communicated this observation, having assur'd me in the same letter, that he had sometimes dissected persons who were taken off by a sudden death, in whom he neither found the aorta ruptur'd nor dilated, but only affected with this kind of pustules and prominences; neither is this far unlike what I have written to you, at different times, in observations wherein diseases of the same artery, more inconsiderable in appearance, have been describ'd, of which fatal cases have nevertheless been the consequence. For which reason, the greater pains ought to be taken, to prevent any signs being hastily overlook'd; if any signs are at length discover'd, from which a probable suspicion may be drawn, of pustules or erosions being latent in the aorta. And you might have seen above, that some signs of erosions, pointed out by Bellini, were not omitted by me (*c*); signs which he mention'd at the same time that he spoke of the stony or bony scales which were the occasion of them. But it is necessary to confirm them, and to add others.

And as it is useful to physicians, in making a diagnosis, to know what frequently precedes disorders, I would have you attend to what the worthy Plancò, whom I have already commended, has immediately added, after having describ'd, from another patient, the great artery (*d*) to be internally "ulcerated, as it were, and corroded, and abounding with various pustules; " which I have often observ'd," says he, " in other bodies, and particularly " in the bodies of those who have labour'd under the lues venerea, or have " been dispos'd to an aneurism of the aorta, or to a dropsy of the thorax." But as ulcerations of this artery often happen from little bones, as is hinted above (*e*); and as pustules sometimes produce concretions so very similar to bones; no doubt but you see how often, in disorders of the aorta, those remedies may be suitable, which are generally us'd against internal ulcers, or at least those which do not at all, or but little, excite the motion and effervescence of the blood. For they would either resist, as far as is possible, the effect of the bones; which if it be carried to its height, disposes to fatal ruptures of the aorta, and internal effusions of blood; or would counteract the

(*c*) n. 24.(*d*) Epist. de Monfr.(*e*) n. 24.

cause by which these hard concretions are generated: and by this means would, at least, prevent their increase, if not totally remove them.

But I seem already to have written enough on the subject of sudden death, and of the change of arteries into bone; of which last I took occasion to treat from the consideration of the former.

31. Now, the twelfth section would furnish an opportunity of writing on the subject of other bones that are in a preternatural state; for this section, which closes the second book of the *Sepulchretum*, is intitl'd *De Gibbositate*, and gives you the dissections of ricketty bodies, and such as were gibbous, or had incurvations of the spine. But I do not remember to have ever dissected any who had been affected with the rickets: nor do I remember that Valsalva ever did, nor any of my friends in Italy, except that very experienc'd man Anthony Benevoli (*f*), who has himself, at my desire, publish'd his own observations, written in a clear and ingenious manner; and not only in regard to what he remark'd in dissection, but also in regard to those methods which he had experienc'd to be useful in the cure of a disease which was, in other respects, very difficult to cure. But from foreign writers you will have many dissections of ricketty bodies, which you may in like manner add to the *Sepulchretum*. For if you turn over only the volumes publish'd by the Cæsarean Academy, as Dec. III. A. 9. (*g*), Centur. III. (*b*), & Act. I. (*i*), & V. (*k*), you will find several. However, in regard to the two last, see whether that retraction, or rather that defect of the left lobe of the lungs, so as not entirely to cover the heart, or rather that part of the mediastinum which includes the pericardium, related to "a defect of conformation" in ricketty persons; or whether it was the same that Eustachius (*l*) delineated as being natural, and Santorini afterwards describ'd (*m*).

I have, however, dissected many gibbous bodies; but what I have seen in them relating to this gibbosity, has partly been explain'd to you already, and will partly be explain'd hereafter, inasmuch as some of them died of one disease and some of another. And if you read the histories of these persons, it will be easy, in the first place, to see that this disorder does not appear sometimes (*n*) till about the fortieth year; and, in the second place, that Severinus had rightly admonish'd, in opposition to Cardanus, as you will see in the section of the *Sepulchretum* above spoken of (*o*), that it is not always necessary, that to the disorders which are found in the situation of the bones of the sternum, and of the ribs that are connected therewith, a deprav'd situation of the vertebræ of the back should also correspond: which is confirm'd by my observations, and particularly in a certain woman (*p*), and partly in an old man (*q*): to which you may add what was observ'd in a ricketty child, of which the Act. Nat. Cur. just now quoted, give the history (*r*); and what the celebrated Haller (*s*) has describ'd from another little child very accurately.

(*f*) Osservazioni 38. e segui.

(*g*) Obf. 240.

(*b*) Obf. 11.

(*i*) Obf. 53.

(*k*) Obf. 146, & 147.

(*l*) Tab. 9, & Tab. 15. Fig. 1.

(*m*) Obf. Anat. c. 8. § 1.

(*n*) Epist. 10. n. 13, 14.

(*o*) In Schol. ad Obf. 6.

(*p*) Epist. 45. n. 23.

(*q*) Epist. 7. n. 11.

(*r*) Tom. 1. Obf. 53.

(*s*) Opusc. Pathol. Obf. 10.

However,

However, we must confess, with Severinus, that Cardanus has, as in most other things, taught what is true: and even that the vitiated posture of the vertebræ is the much more frequent cause, that a perverted situation of the ribs, and of the sternum, follow, is demonstrated by other of my observations, and by those of others. Among which, if you read one in particular, that I have given in the fourth letter (*t*), you will at once understand, that not a perverted and incongruous situation of the ribs, and sternum, was the consequence of a distortion in the spine, but a perverted situation of the viscera and vessels of the belly also, and will at the same time conjecture, how much, of course, not only the smaller vessels, among which is, in particular, the thoracic duct, but also the greater part of the nerves, and other parts of the like kind, must have been disturb'd from their natural situations, which considerations neither time nor place, nor the principal design we had then in view, suffer'd us to prosecute.

Moreover, even the celebrated Helwich (*u*) will teach us, how much all the thoracic viscera were forc'd into a very narrow compass, and confin'd, by the spine being distorted anteriorly in a certain matron; and the illustrious Haller will inform you (*x*), how far the great artery was remov'd from its proper seat in another woman, whose spine had been forc'd into serpentine inflexions, different from what we see in a natural state, by carrying heavy burthens on her back, which was her method of earning her livelihood. And that this kind of life is, at other times, among the external causes of gibbosity, especially in young bodies, is not only demonstrated by reason, but by the observation of the celebrated Nebellius (*y*).

32. But in regard to the other causes, from which distortions of the spine begin, for the most part, to arise, and by which they are encreas'd and continu'd, if you consult the ancients, I fear you will not be able to find anything satisfactory; I mean, where you recede from that kind of causes which evidently proceeds from an injury that happens externally, or from violence. Nor is it to be wonder'd at, since in ancient times the bodies of men were not dissected, and much less those of gibbous persons.

And after they at length began to dissect human bodies, if they happen'd to light on bodies of that kind, it either seem'd sufficient to them to have declar'd, in one word, that there was "a bad composition of the bones," as it did to Vesalius (*z*), when he dissected "a gibbous girl, who had pass'd "her seventeenth year;" or to have describ'd and represented, in a figure, the lateral flexures of the spine, in the manner of a serpent, as Hildanus has done (*a*), who has, perhaps, given the first representation by drawing that we ever had of a disorder of this kind, from another girl of eight years old. Betwixt these two, however, besides Falloppius (*b*), Pinæus flourish'd, who, as you will even read in this twelfth section of the Sepulchretum (*c*), observ'd that the vertebræ of the spine "were very frequently united to-

(*t*) N. 16.

(*u*) Eph. N. C. Cent. 10. Obs. 32.

(*x*) Opusc. modo cit. Obs. 11.

(*y*) Act. N. C. Tom. 5. Obs. 109.

(*z*) Epist. de Rad. Chyn.

(*a*) Cent. 6. Obs. 75.

(*b*) Vid. hujus verba Epist. 56. n. 36.

(*c*) Obs. 6.

"gether into one substance, sometimes in a greater, and sometimes in a "smaller number, --- and reduc'd, as it were, into one bone;" and that these vertebræ "were inflected outwardly, or inwardly, or to one side," (which latter he says below happens "the most frequently") "from which "inflexions" all the species of gibbosities which he mentions "arise." As to what I have said that Pinæus teaches below, you will not see it in the Sepulchretum, but in that chapter of his work, which is there referr'd to, that is in the ninth (*d*); where, in regard to the right scapula of the girl in France being higher and more full than the left, and the causes of this circumstance, he has written most of the things which Riolanus (*e*) has since done in his Encheiridion. After Pinæus, others, among whom are the two gentlemen lately commended, Helwich (*f*) and Haller (*g*), have observ'd the coalition of many vertebræ into one bone, in gibbous bodies, and Ruysch in particular, who (*b*) "many times" saw the bodies of several vertebræ so united with one another, and compress'd, that some of them seem'd not only to be diminish'd, but "reduc'd into nothing." And Palsin (*i*) has observ'd the beginnings of so great a diminution in the skeletons of gibbous infants, that is to say, the bodies of the vertebræ, where the curvature took place, very much flatten'd, and the cartilages that lie betwixt these bodies, in that place, very thin.

33. After observations it seems less difficult to judge of the causes of inflexion of the bones of the limbs, and of the spine itself. Of these causes you have two kinds propos'd in the Sepulchretum (*k*); one from Glisson, and the other from Mayow. Both of these kinds consist in a more plentiful nutrition; the first, of the bones of one side than of the other; and the second, of the bones than of the muscles which are attach'd to them. That is to say, whether one side of the bones continue to be nourish'd a longer time than the opposite side, as Havers suppos'd (*l*), or whether both sides are nourish'd for an equal time, but one of them more plentifully than the other, as Glisson had suppos'd, without doubt it comes just to the same thing; I mean, that the side which has been nourish'd the longest time, or has receiv'd the greatest quantity of nutritious matter, inclines itself to the opposite side. Thus imagine, that if the right side of the vertebræ has grown higher than the other, the spine will be inflected towards the left: and that the same thing will happen, if the ligaments that lie betwixt the vertebræ, or rather the cartilages, have their substance less increas'd, or have their height, in the left side, diminish'd. And in this manner you will, in general, conceive of the first kind of causes. And the second you will conceive of, if you suppose that the muscles, which lie on the left side, are less increas'd than the bones, or more contracted than the muscles, which lie on the right side, whether this is the consequence of convulsion, or from their being endow'd with greater strength than the muscles on the right side, and that either from the birth, or by reason of the power of the

(*d*) L. 2.

(*e*) L. 6. c. 17.

(*f*) (*g*) Obs. cit. supra ad n. 31 in fin.

(*b*) Obs. Anat. Chir. 68.

(*i*) Anat. du corps hum. tr. 5. ch. 9.

(*k*) In Append. ad Additam. ad hanc Sect. 11.

(*l*) Osteolog. Nov. Disc. 2. vers. fin.

muscles,

mufcles, on the right fide, being diminifh'd, from a paralyfis, or from any other caufe whatever. For it is proper to add all thefe confiderations to the theory of Mayow, which amount to juft the fame thing.

Nor does it efcape me what Havers (*m*) objected to this theory, which has been approv'd of by celebrated men; I mean, that, as betwixt the extremities of the mufcles a joint is interpos'd, it will happen, that the mufcles, when shorten'd, by drawing the bone into which they are inferted, do indeed change the fituation of that bone, according to cuftom, but not the figure of it. However, to pafs over other things, when the queftion is of the vertebræ and of the fpine, as it is at prefent, it is the fame thing to change the fituation of the vertebræ, as to change the figure of the fpine. Thus there was a diforder in the mufcles of a crooked man, of a tall ftature, as the obfervation of Kerckringius, which you have here in the Sepulchretum (*n*), demonftrates. In which (*o*) you will alfo find this to approve, that it happens from the mere imbecillity of the mufcles of the back, "that the "nodding fpine is curv'd, and that this is, perhaps, one reafon why all old "men are gibbous." And indeed, where the mufcles fhall continue for a long time to keep the fpine in a curv'd pofture, even under the influence of the will, they will change the figure, not only of the cartilages that lie betwixt the vertebræ, but alfo of the vertebræ themfelves; for the vertebræ will increafe in their heighth on that fide where the convex of the curvature fhall be, and will decreafe, or at leaft will be lefs encreas'd, on the oppofite fide, in confequence of their being more clofely comprès'd to each other; whereas, on the other, that is on the convex fide, they are much lefs clofely prèfs'd one upon another than the laws of nature require. And thefe circumftances will fo much the more eafily take place, in proportion as the vertebræ, by reafon of a tender age, fhall be more diftant from the bounds of their increafe, and in proportion as they fhall be lefs hard, whether this be from the fame tendernes of age or even from difeafe, as in that gibbous girl of Hildanus (*p*), in whom "the bones themfelves were fo foft, that "fome of them might be moulded like wax;" and the fpine was "foften'd:" and in like manner, in a crooked young man, of fixteen years of age, to whom this fecond obfervation of the Sepulchretum relates, "the vertebræ, "chiefly," were affected nearly in the fame manner.

Wherefore, although I would not deny, that the firft kind of caufes may fometimes exift by itfelf, and be the caufe of gibbofity; yet I believe that it is more frequently the effect of the caufes of the fecond clafs, that is, of the contracted mufcles.

34. And indeed, even Mery himfelf (*q*), by whom we have a defcription, delineation, and explication, of the fpine being inflected laterally, in a serpentine figure, which is certainly the beft explication of all that have hitherto ever come out, has confider'd that diforder, which might be in the feveral vertebræ, as the act of the mufcles that are attach'd to the fpine, being

(*m*) Ibid.

(*n*) Append. 1. ad Obf. 7.

(*o*) In Schol. ad Obf. 1.

(*p*) Vid. *supra*, n. 32.

(*q*) Mem. de l'Acad. R. des Sc. A. 1706.

in contraction on one side; whereas the opposite muscles, being paralytic by reason of the obstruction of the nerves, had no power at all to act as antagonists to them.

Yet still there is something in this explication, also, of which you may enquire the cause. For if the spine had only had one curvature, suppose towards the left side; it would not be at all difficult to understand the case, only by supposing, as was a little before hinted, that the muscles on the opposite side, that is, on the convex side of the curvature, are paralytic. But now, when beneath the first curvature another succeeds, as in the observations of Hildanus (*r*), and as frequently happens in the observations of others also, quite in a contrary direction to the upper curvature; it actually appears, if we are to sit down by this explication, that the muscles must be suppos'd to have been paralytic, in this case, even on the convex side or the inferior curvature: but how this resolution, or paralysis, of the muscles can happen alternately, that is, how the resolution, which was said to be on the right side above, can happen below on the left, does not easily appear. However, I would have you, in such a difficult question, consider whether it is possible, that the superior curvature, which is owing to the resolution of the muscles on the right side, could itself be the cause of resolution in the muscles which are on the left side below. For the nerves, going out through the foramina which are intercepted by the sides of the vertebræ, descend in great measure obliquely, to insert themselves into the muscles that move the vertebræ which lie beneath. If, therefore, the superior curvature force the vertebræ so closely one upon another, on the hollow side, especially when they are very soft by reason of the tender age of the patient, or even from disease, so that these foramina become considerably less'n'd, some of the nerves that come out at these foramina may perhaps be so compress'd, that the muscles, into which they go down to insert themselves, may be made paralytic. But these muscles are on the left side. This inferior resolution, therefore, will be on the side opposite to that in which the superior was; so that, for this reason, the right muscles prevailing, an inferior curvature happens, which is an effect of the superior curvature, and in opposition to this, is seen to be turn'd the other way.

But these things you will suppose that I have added, as many observations, not only in found, but in gibbous bodies, require them, not so much with a view to determine any thing myself; but rather to stir you up to devise a better theory. Farewel.

(*r*) Supra cit. ad n. 32.



